

DATE GROWING
IN THE
OLD AND NEW WORLDS

BY PAUL B. POPENOE



DATE GROWING



FIFTY-THREE POUNDS OF DATES

From a photograph taken by Jean Geiser at Colomb-Bechar, Department of Oran, Algeria.

DATE GROWING

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BY

PAUL B. POPENOE

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WITH A CHAPTER ON THE FOOD VALUE OF THE DATE

By CHARLES L. BENNETT, M. D.



ALTADENA, CAL.
WEST INDIA GARDENS

1913

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PREFACE

Although dates have been the object of culture for several thousand years, it is still too early to write a complete account of the industry. At no time in history has their cultivation been undergoing more change than at present. A year gives us an entirely new aspect of a problem; a month, even, may cause us to revise our views respecting some part of it.

Accordingly, I am aware that this book can not be considered final. It aims only to present a practical exposition of the methods of growing the date, as they are understood in the Old World and in the United States today; in six months more some phase of the work might need to be presented in an entirely different way.

Nevertheless, it is hoped that the volume may be of service to the men who are actually engaged in building up an industry that is certain to be one of the largest fruit enterprises in California and Arizona. There is nothing else in print that covers the ground. The material for the present volume has been gathered during two years of travel in the most famous date-growing regions of the Orient, on behalf of the West India Gardens of Altadena, California. In addition to my own study of cultural methods in the United States, I have had the advantage of assistance from all the men best qualified to help me, and I am glad to have this opportunity of publicly thanking them. References throughout the book indicate the extent of my indebtedness. It

is a particular pleasure to acknowledge my obligations to Walter T. Swingle of the Bureau of Plant Industry, who has had general charge of experimental date work in the United States; to Thomas H. Kearney, whose study of Tunisian dates is the best work of the kind that we have; to David Fairchild of the same Bureau, to whom is due credit for the introduction of several hundred old world varieties of dates into the United States; to Silas C. Mason and Bruce Drummond, both engaged in date research work for the Bureau; to Dr. A. E. Vinson and other members of the staff of the University of Arizona; to Dr. L. Trabut, botanist to the government of Algeria; and to my brother, F. W. Popenoe, now of the Bureau of Plant Industry, who accompanied me during much of my travel and gave me invaluable help in many ways.

I have found American consuls in all parts of the world anxious to be of assistance, but none has exerted himself so much on my behalf as Homer Brett, United States consul at Masqat, Oman. Being informed of the date of my coming, he secured from the Sultan of Oman a dozen of his own camels, had the caravan ready for immediate start upon my arrival, and shared with me the hardship, danger, and interest of the one hundred and twenty-five-mile ride to Samáil Valley, which had never before been seen by a student of the date industry, although it is the home of one of the most important commercial varieties, the Fardh. Our trip ended rather sensationally, involving the kingdom in a year of civil war, but it also resulted in the introduction to California of a number of varieties earlier in ripening than anything which had theretofore been known.

From American missionaries I have invariably met with a hospitality which can never be repaid. The traveler in unbeaten paths realizes better than any one else the extent to which the missionary is not only the carrier of religion, but of civilization, and while he admires the way in which they are uplifting the native, he experiences also a purely personal feeling of gratitude when he is permitted to rest in one of these oases of Occidental culture after a more or less prolonged experience of life that is based on so much lower ideals. Without the co-operation of missionaries, and in particular of those at Busreh, Turkey, who represent the Reformed Church in America, my work would not only have been far less pleasant—it would have been impossible.

A few remarks upon the problems of orthography in regard to the names of date varieties will be in place in this introduction. In order to make American practice conform to that of the rest of the scientific world, I have transliterated all Arabic date names on a uniform system, which is based on the principle in use for a century or more, that consonants should be pronounced as in English but vowels as in Spanish or other continental languages. This is the simplest and most natural method of dealing with a hard problem, and it is particularly simple for residents of the southwestern United States, because they are already familiar with the pronunciation of Spanish words. The system was elaborated by the International Congress of Orientalists at Geneva, in 1894, and recommended for general adoption; it has been adopted with occasional insignificant changes by the British, Indian and Egyptian governments, the geographical bureau of the United States govern-

ment, and by many other foreign governments, as well as learned societies, institutions, and individuals, so that it may fairly be said to represent the universal practice of enlightened people. It seems a pity that the date growers of the United States should be the only ones to lag behind the march of progress; and I have, therefore, not hesitated to make changes in accepted spellings, when necessary to make them conform to standard, excepting in a few cases like the word Deglet, which may fairly be considered a trade name now, and the correct form of which, Daqlet, would hardly be recognized.

There is the less excuse for the confusion into which date nomenclature has fallen because most of it was caused by the erroneous supposition that what was a correct spelling for the French language was a correct spelling for the English. A date was therefore introduced under the name of Rhars, when all English practice demanded that it be called Ghars—a spelling that is also in more accord with the pronunciation of natives in the district where it grows. As the French government itself has now adopted the spelling Ghars, there is little excuse for asking Americans to retain a French mistake which the French themselves repudiate, and I have accordingly adopted the spelling Ghars throughout.

Even more conspicuously unnecessary is such a spelling as Hadji, for a word which is correctly transliterated by everyone Hajjî. The Frenchman, with his peculiar pronunciation of the letter j, may have needed the spelling Hadji, but surely the American did not; yet he was asked to accept it, as he was asked at another period to accept the vulgar pronunciation of the Egyptian peasant—Haggi. If pro-

nunciation is to be based on any principle at all, it should be based upon the practice of the best educated people, not the worst. There is only one correct way of spelling the word in English, and that is Hajjî; it is the simple and natural way; what justification can be given for an attempt to confuse the reader by any other spelling?

In accordance with the principle that vowels should be pronounced as in the continental languages, the reader will find Thúrí, instead of the more familiar but more misleading Thoory; and so on through the list. Certainly the English pronunciation of vowels is not so simple and rational that we should desire to perpetuate it in words from an oriental language.

The appearance of the letter *q* unaccompanied by the vowel *u*, which always attends it in English, may at first cause a little surprise, but there is no valid argument against it. I use it to transliterate the Arabic letter Qaf, which is properly pronounced like a guttural *ck* in *stick*, but colloquially is often pronounced like *g*, whence we have Deglet for the more correct Daqlet.

Most of the changes which I have made in date nomenclature have been due to the necessity of purging the list from incorrect French influence and bringing it into line with the usage of the whole modern scientific world, including the French; at other times I have substituted the classical form, which would be used by all educated men, for some vulgar dialectal form, as Kasbeh for Kseba. Arab names are not easy for the layman—often they bother even the expert; but I believe that they will offer fewer problems now that they are made systematic, and if the reader is still unable to twist his

tongue around them he may derive consolation from the fact that many other good men have had the same difficulty. Two thousand years ago the omniscient Pliny explained in his great Natural History that he could give a list of forty-nine varieties of dates—if he could only remember their barbarous names. As he could not, his list was cut down to a dozen, and even these he designated by Greek or Latin names. Eventually we may find it desirable to adopt a similar expedient and use the English equivalents for Arabic words. For this reason, and because of their general interest, I have, when possible, added the translation of each variety name.

PAUL B. POPENOE.

ALTADENA, CALIFORNIA
September 1, 1913.

THE DATE PALM

CHAPTER I

THE DATE PALM

The date palm is something more than a fruit tree which furnishes the principal means of existence to hundreds of thousands of people. To the Arab it is a sacred institution identified with the Semitic race since the dawn of history and consecrated by Muhammad both in his public and his private life.

"There is," said the prophet, "among the trees one tree which is blessed, as is the Muslim (among men): it is the palm;"* and he explained on another occasion the reason for this pre-eminence, as follows:

"Honor your uncle, the palm: I call him your uncle because he was created from the earth left over after the creation of Adam (on whom be peace and the blessings of God!). The palm resembles man by its erect position and its height, by its separation in two sexes, and by its necessity for the pollination of the female. If its head is cut off it dies; if its heart is exposed to too great a strain, it perishes. Is it not the same with man? If its leaves are cut off it can not grow others in the same place; no more can man if he loses his members. It is covered with a fibre, analogous to the hair of man."†

The tradition continues that Adam cut his hair and nails with an instrument miraculously provided, and buried the cuttings in the ground of Eden. Immediately there sprang from the spot a palm tree, fully grown and covered with ripe dates. Adam fell

* Al Bukhârî, Ch. 42, on authority of Abdâllah b. 'Umar.

†Kamal al Dîn of Cairo in "The Life of Animals and Plants." The tradition is given in slightly different forms by many writers.

on his face in adoration, and the angel Gabriel, appearing, designated the palm as his future food, saying: "You were created of the same material as this tree which shall nourish you."

Satan, of course, was not long in appearing on the scene, and asked Adam why he was thus prostrated in an attitude of worship before a tree. When he learned of the circumstances of its creation, and realized what a proof it was of the beneficence of God, he wept bitterly; his tears falling on the roots of the palm caused it suddenly to put forth the spines which still make its leaves formidable.

The earliest known records of Egypt and Assyria show that the palm held almost as important a place then as it does today.* In the Bible it appears only as an ornamental, the climate of Palestine not being well adapted to ripen the fruit; but it was one of the chief *motifs* in the decoration of Solomon's temple, and according to Arab historians it was that mighty potentate who impressed on the back of the seed the small circle (the germ pore), by the imprint of his famous ring, of mingled iron and brass, inscribed with the secret name of God, by virtue of which he possessed control of all animal life and the spirit world.

Still later the palm served as a shelter to Mary when she gave birth to Jesus Christ, and it was by the sweet, ripe dates that the pains of her travail were allayed. Muhammad tells the story as follows:†

*Cf. Moldenke. *Über die altägyptische Baume*, p. 31.

†Koran, XIX, 23-26. Critics have not failed to point out that this account strongly resembles that related by poets of the birth of Apollo, whose mother, Latona, is also said to have been delivered under a palm, in the Isle of Delos; and in this case also, the infant spoke to her. Pliny and Cicero say the palm in question was in existence in their time.

“The pains of childbirth came upon her near the trunk of a palm tree. She said: ‘Would to God I had died before this, and become a thing forgotten, and lost in oblivion!’ And he who was beneath her called to her, saying: ‘Be not grieved; now hath God provided a rivulet under thee, and do thou shake the body of the palm tree, and it shall let fall ripe dates upon thee, ready gathered. And eat, drink and calm thy mind.’”

The commentators,* intent on making the most of this Muslim miracle, assert that the palm was merely a withered trunk, without any crown of leaves, and that this happened in the winter season, when dates could not ripen naturally. An early tradition puts the birth in Egypt, near the town of Ahnas; Sa’ab al Akhbar declares he saw the identical palm there, and Makrízí bears witness to the same effect, but Ibn Batútah, one of the greatest and most accurate of Arab travelers, says† he saw “traces” of it in the church at Bayt Lahm (Bethlehem). On the basis of this story, Muhammad advised all mothers to nourish themselves with dates, in order that they might have good and abundant milk.

But the final stamp of perfection was put on the date by the prophet’s own use of it. During his years of poverty at Madína, his food for days at a time consisted of nothing but dates, washed down with water—a diet which is still forced upon thousands of nomads each year.‡ When his circumstances became easier, he developed into a real gourmand, and among his

* e.g., Al Baydáwí, Yahyá, Al Zamakh.

†Travels, I, p. 120, Paris, 1853.

‡Told by his wife Ayísheh and set down by the secretary of Al Waqídi.

favorite dishes were fresh dates and cucumbers, and dates with milk or butter.* He drank regularly an unfermented liquor, made by pouring water on fresh dates and letting it stand over night; therefore this drink, called nabídh, is still a favorite at Madína and elsewhere. Finally, he declared to his followers: "Whoever eats seven dates of the variety called Ajweh first thing in the morning will not have to fear either poison or treachery that day."†

With such a history to supplement its physical value, it is not surprising that the palm is held in veneration by Arabs.

*Father Jaussen (*Coutumes des Arabes au Pays de Moab*, Paris, 1908) met various individuals who told him they tasted nothing but dates and milk for six months at a time. His testimony can be confirmed by that of almost every traveler.

†Al Bukhárí, *Traditions*, Sec. LXX, ch. 43, on authority of Salad b. Abú Waqqas. Burekhardt (*Travels in Arabia*, II, p. 211 f.) followed by Burton (*Pilgrimage*, II, p. 401) errs in saying the variety thus recommended by Muhammad was Al Birní. Bukhárí, who wrote in the third century after Muhammad, is the highest authority on the Traditions.

THE DATE PALM COUNTRY

CHAPTER II

THE DATE PALM COUNTRY

Conditions generally favorable to the production of dates are well understood. It is not a tropical but a sub-tropical culture. No summer heat is too great for it, but it will also tolerate severe frost in winter; it is easily satisfied as regards soil, if the water supply is sufficient. These are the conditions under which its culture has been carried on in the past, and they still hold good; but recent developments indicate that dates may be successfully grown in regions which have hitherto been considered entirely unsuited to the palm; therefore the subject demands a somewhat careful study.

In the United States, Southern California is indisputably the region best adapted to commercial date culture. Coachella Valley, with its slight rainfall, intense summer heat, and prevailing sandy soil exactly fulfills the conventional requirements, as they were outlined in the preceding paragraph. For late varieties, which require a high sum total of heat to mature, and for the Saharan varieties in general, it can not be surpassed. It would probably prove equally well suited to varieties from the interior of Arabia, if we could secure any such. Imperial Valley is almost as well adapted to these same varieties, although its soil is predominantly clay, and often a very stiff clay. But in the Sahara, Deglet Núrs which grow in the heavy clay of the Zibán are scarcely inferior to those which grow in the light sand of the Sûf. The lower part of the Colorado River Valley

may be classed with these two, physical conditions being much the same.

In Arizona, where date culture in a scientific way was carried on earlier than in California,* conditions are quite different, particularly in the Salt River Valley, where a large part of the rainfall comes in midsummer, at a time which proves fatal to success with many African dates. Profitable date growing is entirely possible here, as also in the Gila and Casa Grande Valleys and probably several parts of the mesa in Arizona; but not with all the varieties which succeed in the adjoining state. Dates must be chosen which do not ripen too late, and which are unaffected by summer humidity. This eliminates most North African dates and leaves Egyptian and Persian Gulf varieties as most desirable.

Within these two states, California and Arizona, are the only regions where it can be said, at present, with confidence and on the basis of real evidence, that date culture is profitable in the United States. There are some other regions where it is possible, and where it may be and probably will be proved to be profitable, but where data have not yet been accumulated which enable one to speak with certainty.

In this class may be put a large part of the interior valley of California, the northern half of which is named Sacramento and the southern San Joaquin. Around its outlet to San Francisco Bay there is a region where the climate is probably ill suited to the date, but farther north and south it should be well adapted to hardy, early ripening sorts. Scattered experiments in the past have shown that good dates

*For its history see Toumey, J. W., *The Date Palm*. Ariz. Agr. Exp. Sta. Bul. No. 29, Tucson, June, 1898

can be grown there, but at present commercial planting is checked because of quarantine restrictions on imported date palms, and these restrictions are likely to prevent development in any rapid manner. In the meantime one could make a start by selecting some very early seedling in Southern California and establishing its offshoots in a warm part of the interior valley. When imported offshoots can be introduced into the central counties, early sorts from the Persian Gulf would give every promise of success. There seems no reason why this section of California should not become eventually a large producer of dates.

Finally, there is a small district in Texas, around Laredo, where encouraging experiments have been made by the Department of Agriculture of the federal government. This is evidently a region adapted to producing dates, and it completes the list of best United States locations for date growers. Most of the land in the southwest, which is amply hot and dry in summer, is too cold in winter.

In Mexico there is undoubtedly a large amount of land which is well adapted to the culture, just across the line from the California border. Conditions here are much the same as in Imperial and Coachella Valleys to the north. The date palm is a well established industry around the Gulf of California, where conditions are not desert-like, particularly because of the ocean breezes and consequent humidity. Dates do not ripen well, but it is entirely possible that suitable varieties could be found which would make the culture a paying one there. Probably some parts of the plateau in Mexico also are adapted to the industry.

The idea, however, that the palm could fruit

only in an arid region has been set aside by further investigation and experiment. I found the date growing side by side with the banana, coconut, and tropical pawpaw (*Carica papaya*) in Oman, on the eastern coast of Arabia; and these three plants all require a humid climate. In Tunisia excellent bananas are raised in the shade of the palms. But most conclusive on this point are some of the tests made in British possessions.

In India, for instance, there has been during the last half century a small but continuous effort to establish the date palm on a large scale. It has been growing there for centuries—introduced, according to legend, by the troops of Alexander the Great—and in desert regions of the Panjab and Sindh excellent fruit can be produced. Not content with this, the investigators tried to establish it in all the warm parts of the peninsula, and although their efforts have hitherto failed in most cases, from a commercial point of view, they have given some surprising indications as to the way in which the palm can adapt itself to varying weather conditions. The great drawback to their work was the arrival, in June, of the monsoon rains, which come with great force at the very time when the earliest dates are ripening, and last until November. At first sight it would appear that this made the growing of dates absolutely impossible, yet there is reason to believe that even this obstacle may be eventually overcome. At Saharanpur in the United Provinces, where there is a five acre experimental garden, several varieties of very fair dates have been found which have been able to mature their fruit before the rains set in—and this in spite of the fact that the winters there are by no

means frostless. Evidently, propagation of these few varieties will eventually establish an industry which can furnish dates for home use, at least.

Saharanpur is in Northern India, but the region is not typically desert, even without the summer rains. At Trichinopoli in Southern India, in a genuinely tropical district, success has also been obtained in an experimental way, principally with seedlings; the superintendent reports* that three varieties of good dates ripened in 1908. And at Bangalore, Lucknow, and many other places in India results have been obtained which, while far from making commercial production of dates an immediate possibility, show that the field is by no means hopeless, that success depends only on finding suitable varieties, and that such varieties can be found.

In the tropical island of Zanzibar, too, experiments have been successful enough to warrant the government in importing large quantities of offshoots from Oman and Busreh. And, closer home, dates have been ripened in the West Indies, where seedling *Taflalets* have proved particularly interesting.†

As regards extreme of cold, the date palm has shown itself remarkably resistant. In central Baluchistan and the highlands of Persia the culture is profitable even where the cold is prolonged as well as severe; in other regions, where more detailed observations have been possible, it has been shown that a palm under proper conditions may withstand a temperature as low as 5° F. without injury. The severe freeze of January, 1913, in the southwestern

*In a letter to the Reporter on Economic Products, Calcutta.

†Jones, Joseph, in *Agricultural News*, p. 324, Oct. 19, 1907: "The fruit (in Dominica) ripened well, there being little loss through decay or fermentation."

United States left the palm little damaged, although officially recorded temperatures through which it passed were 15° at Indio, Cal., $13\frac{1}{2}^{\circ}$ at Mecca, Cal., 12° at Tempe, Ariz., 8° and 9° in Texas, and $5\frac{1}{2}^{\circ}$ at Tucson, Ariz. In some cases it killed off many of the leaves, but the fruit came on as usual—in fact the only damage to flowers was in the case of male palms, which seemed in many cases to have been rendered sterile by the temperature. Young palms are naturally more tender, but they can be easily protected. No such low temperatures as these have previously been recorded from a date-growing country,—in Baghdád, for instance, the lowest on record is 17° —and that the palm withstood them successfully shows that frost need hardly be taken into consideration in the future, in selecting a location for palms.

For the man who wants to go into the commercial production of dates in the United States at once, the facts which I have quoted will have little importance; he can only be advised to confine himself to the Salton Basin in California or the low-lying parts of Arizona. But the investigator who wants to find how far he can extend the date-growing region may get encouragement from the experiments of other countries, which show that there is at least a possibility of growing eatable dates in any country where the summers are hot. In deciding as to the climate for dates, it has been the custom to sum up the maxima of heat; but this is a misleading method, for Vinson has clearly shown that the growth of the palm varies not according to the heat of the day, but according to the added heat of day and night: that is, the palm grows best when the night temperature is nearest that of the day, provided both be fairly high. There-



EGYPTIAN DATES IN ARIZONA

A Badrashin palm at Tempe. This variety has proved one of the most satisfactory there.

fore, a region that has hot days but cool nights would be less suited to the palm than one in which the nights were hotter, even if the maximum day temperature was a few degrees lower.

In the choice of soil, few fruits seem so easily pleased as the date. It is usually said that a sandy loam is best, and such a soil is certainly good, but the statement that it is best is a dogma that would be very difficult to prove.

The Arabic authorities, as usual, indulge in a great deal of fanciful speculation on the subject. Qastús says* a piece of land "spotted with black and white" is the best. If he means anything, it is probably that the land should be rich, with some saline efflorescence. Amin al Madaní, who represents the most enlightened modern ideas, says,† "the best soil for growing the palm is a sweet, red clay, and the second best a black soil, sandy and alkaline." It is a widespread Arab theory that land which has been cultivated for a long time is the most desirable, and the modern Baghdádí is always pleased when he can plant on the site of some prehistoric city. The soil of Busreh, which produces excellent dates, is an exceedingly stiff clay. Much of the Egyptian soil is pure adobe. It has already been mentioned that Deglet Núr in Algeria succeeds in sand or clay. If a sandy soil is selected, however, it will have to be liberally enriched with commercial fertilizers, or, better, barnyard manure, in order to produce good

*Qastús b. Lúqa al Rúmí, *The Book of Greek Agriculture*, Ch. 75. This is one of the oldest of Arabic authorities on horticulture; in fact, its origin is lost in obscurity. The best trans. is that of Sarjius b. Halias, an incomplete MS. of which I possess.

†Faqír Amin b. Hasan al Madaní, *Culture of the Date Palm*, lithographed at the Hasaníyeh press, Madína, A. D. 1886.

results. Experiments in Coachella Valley leave no doubt as to that, and the government experiment stations have swallowed up carload after carload of manure.

One may undertake date culture on any fairly good soil, if he uses a little care in selecting varieties adapted to it, but there is one desirable condition: good drainage. The palm requires a large amount of water, under ordinary circumstances, and unless this water can find an outlet the ground will soon become water-logged—a condition that will be especially serious if the soil is alkaline.

A little alkalinity in the soil is no hindrance, for the palm is remarkably tolerant of it. Arabs consider that it does best in a salty soil, and many occidental investigators have followed them in this opinion, but the point can not yet be considered as proved. Ancient writers did not hesitate to advise that common salt be added to the soil, in cases where it was lacking. I know of no region where this practice is followed today, but I never met an Arab who thought that alkali could injure a palm, even in large quantities. They are mistaken on this last point, however, for it is easy to find in Algeria palms which have reached the limit of alkali tolerance, and others which have passed it and no longer flourish. Observation would undoubtedly show the same results in other parts of the world.

Surface indications are by no means a reliable guide, and anyone who contemplates growing dates should investigate his soil to the depth of six or eight feet. It may be excessively saline on the surface, but if there is one stratum of good soil in which the roots can spread out, success will be possible. One per cent

may be taken as a practical limit for alkalinity; if there is a layer of soil with less salt than this, one may grow dates profitably, but if the soil at all depths contains more than this, another location should be found. Best results will be secured if the alkali does not exceed 0.6%, and 3% may be conveniently taken as a limit beyond which the palm will not grow.

If the irrigating water is free from alkalinity, it will, of course, help to counteract that of the soil. On the other hand, if the water is brackish it is essential to keep well within the limit of alkali resistance in the soil, otherwise the combination of salty soil and brackish water will be too much for the palm, even though neither one were excessively alkaline, taken by itself. Salt on the surface of the ground is most conspicuous but does the least harm, and one frequently sees palms flourishing in a soil which is incrustated with alkali on the surface, so that it looks as if covered with snow. In such cases it is certain that there is fairly good soil underneath. The so-called black alkali, consisting of carbonates of sodium and potassium, is much more dangerous than the more or less neutral chlorids, sulfates and nitrates of sodium, potassium and magnesium, which go by the name of white alkali.

It need hardly be mentioned that young plants are more affected by alkali than old ones, and that seedlings will fail in a soil that yet might give good results with adult palms. It is also to be noted that some varieties of date are much more resistant to alkali than others: Ghars and Záhídí are particularly valuable in this respect.

To sum up: one should investigate before he begins, and should not try to grow varieties of dates

ill suited to his conditions; but if he investigates intelligently he may go ahead in confidence, for any good, well-drained soil, even though it be slightly alkaline, is adapted to most varieties of dates.

One of the fundamental propositions of date culture is that the palm requires a large supply of water for irrigation. This rule is apparently subject to some striking exceptions, and future experiments will probably change our ideas on the subject still more, though they can hardly shake the fact that the palm is a water-loving plant.

It is, indeed, astonishing to find what large quantities of water the palm can take without injury. The immense plantations around Busreh—the most important, commercially, in the world—are ordinarily irrigated, and copiously irrigated, every twelve hours throughout the year, for the operation is performed by the action of the Persian Gulf tide, which backs up the fresh water in the Shatt al Arab. The admirably managed plantations of Fardh dates in Oman usually get a good irrigation once a week. Many of the palms in Egypt are continuously inundated for two months during the summer, and the growers never worry about possible danger to the crop unless the water has been on their roots for more than seventy days. Certainly there are few fruit trees that could survive such tests.

It is such characteristics, and the fact that the palm in the desert is only found around water holes, that led poets to name it Friend of the Fountain. Faqír Amin al Madaní expresses the general opinion when he says: "Know that no culture in the world stands more water than the palm, and turn the stream on it every day, remembering that every



AFTER A HARD FREEZE

Palms at Tempe, Arizona, lost many leaves in temperature of 12 °F., but crop was uninjured. Egyptian palm, variety Badrashin.

time you increase the water supply you increase the crop, and increase equally the strength of the palm itself. The palm flourishes under such conditions, and its strength and vigor will be so much increased that ten palms grown under such conditions will be worth one hundred grown in the ordinary manner."

Opposing this we find some surprising facts. At Madína, which to an Arab is the world's headquarters of scientific date growing, many of the palms are never irrigated,¹ but depend on the insignificant rainfall for whatever moisture they may receive, and the accurate Burckhardt† assures us "the fruit of the latter, although less abundant, is more esteemed." In Egypt some of the best dates are said to be grown without irrigation, particularly the varieties *Amhat* and *Samání*. One grove in Coachella Valley produced well last year, although irrigated only six times.

Such facts have led many to suppose that the palm might give good results with a small amount of water. We have not yet sufficient data to decide on this point, but one should be very cautious in trying to grow dates by dry farming. All of the above cases may be explained by supposing that the roots of the palms reach ground water, in which case they would of course require no surface irrigation. The Tempe garden has not been irrigated for seven years, because of the high level of ground water. The largest plantation at Baghdád—that of Kathim Pasha, with 20,000 palms—had not been irrigated for a year, when I saw it, and yet it produced a good crop of fruit; but investigation showed that it was located in what had formerly been the bed of the Tigris River, and although

†Burckhardt, John Lewis. *Travels in Arabia*, vol. II, p. 211 ff. London, 1829.

the stream has taken a new channel, doubtless there is still underground water below the plantation. It is also proper to note that, in the case of Madína palms, Burton contradicts his predecessor, saying, "One of the reasons for the excellence of the Madínah dates is the quantity of water they obtain; each garden or field has its well; and even in the hottest weather the Persian wheel floods the soil every third day. It has been observed that the date tree can live in dry and barren spots; but it loves the beds of streams and places where moisture is procurable. The palms scattered over the other parts of the plain, and depending solely on rainwater, produce less fruit, and that too of an inferior quality."*

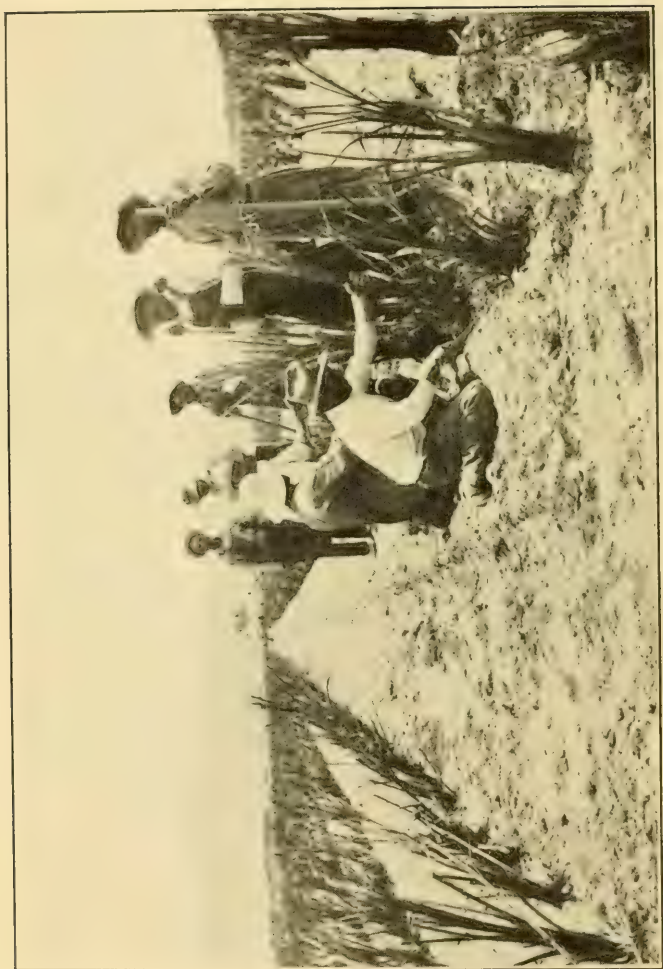
The result of these facts is to leave a grower somewhat uncertain when he asks himself the important question, "How much water do I need for an acre of palms?" Estimates published in the United States vary from one-fifth of a miner's inch per acre to one inch. It is certainly much better to start in with too much than too little, and in the present state of knowledge one would be ill-advised who attempted to start a date plantation without an abundant water supply, even on soil which held moisture particularly well. On such a soil, the estimate of one-fifth inch per acre might possibly suffice; on a light sandy soil one would not have too much if he possessed a full inch for each fifty palms, and in general this quantity should be available, if one wishes to be safe. If a

*Burton, R. F., *Personal Narrative of a Pilgrimage of Al Madínah and Meccah*, vol. 1, p. 403. As to the excellence of the unirrigated fruit, Burckhardt is more likely to be correct, for a letter of Muhammad to Harith b. Kaftan is extant, concerning a division of spoils in which the prophet took the unirrigated palms and left the irrigated ones; and he was not the man to take the worst of anything. Cf. Júhárí, art. Dhamíneh.

subsidiary crop is to be grown between the palms, one must not fail to make allowance for the additional supply of water needed. And this supply will have to be an absolute minimum, for the palm naturally demands most water in midsummer, when the water supply is probably at the lowest point it reaches during the year.

Cold water is a disadvantage, and warm water a corresponding advantage. The superlative Khalaseh of Hasa is irrigated by hot springs, and the first dates which arrive on the market of Masqat (about May 15) are from plantations around hot springs. The water of wells in the southwestern United States is ordinarily warm enough to be satisfactory. In Samáil Valley and other parts of Oman the water is, in effect, artificially warmed, by passing through cement conduits several miles long, in the hot, open beds of the dry watercourses.

It is worthy of remark that most Arab date plantations get practically no cultivation, and that if the surface of the ground were kept in a condition to retain moisture, a less amount of water would undoubtedly give the same results. But in a dry climate like that of Coachella Valley there is already enough difficulty in keeping choice, soft dates like Deglet Núr from shriveling or mummifying as they ripen, and anyone who embarks in date culture without making sure that he has a liberal supply of water—not much less than an inch to the acre—and without making sure that this supply will be permanent and not subject to diminution during the hottest months of the year, is only inviting failure.



SETTING OUT OFFSHOOTS

Quarantine regulations in the United States require that they be planted in nursery rows and kept there for one year.

COMMERCIAL DATE GROWING

CHAPTER III

COMMERCIAL DATE GROWING

It was shown in the last chapter that the palm may be grown experimentally in many places where it cannot be grown profitably; and that in many regions it may sometime be grown with profit, although there is not yet sufficient proof to warrant anyone making an investment at present. This is a vital point to one who intends to take up the culture with the purpose of deriving profit from it, and he can not afford to confuse successful culture with profitable commercial culture. There is a wide difference between them, which I will try to show in some detail; not only does it exist in respect to the physical conditions under which the palm may be grown, but also in the means by which it is reproduced. The question is, how shall the palm be propagated to give not only good results, but good results from a commercial point of view, the point of view of a man who is more interested in cash returns than in advancing the cause of pure science?

A slight consideration of the case, or experience with any other kind of agriculture, will show that it is important to produce good fruit, but it is equally important to produce fruit that is *uniformly* good, for profitable marketing depends on having a large enough quantity of fruit that is uniform, to permit it to be graded, and sold as graded fruit of a standard pack. The grower who packed half a dozen kinds of apples, or oranges, in the same box would get little more than a cull price for the box, even though each

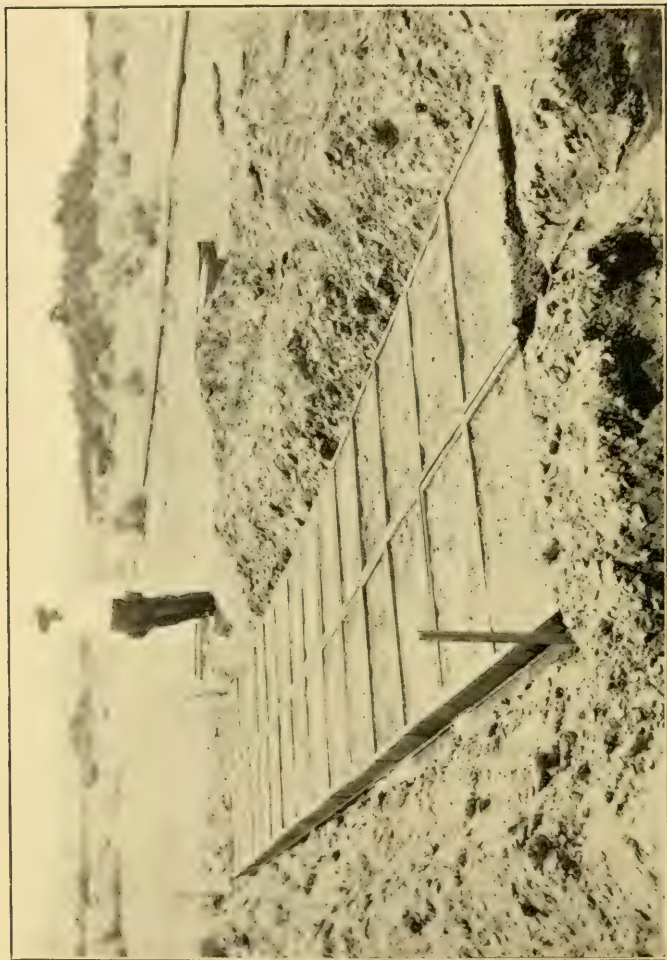
of the apples or oranges might, individually, be of first class quality; but if his box is solid Winesaps, or Washington Navels, he will get the highest market price. The same thing is true, and always will be true, of dates, and the grower who is going into the culture commercially must keep this fact before his eyes at every stage of his operations.

Now, good dates can be grown from seed. All the choice varieties in existence have probably originated in that way, and then been propagated slowly by offshoots. Often seedling dates are inferior but occasionally they are very superior, and anyone who broadly condemns seedling dates as worthless is merely inviting ridicule. Nevertheless, it is not possible to attain the highest degree of success in commercial growing of dates if one depends entirely on seedlings, because no matter how good their fruit may be, it can never be uniform, and that is a necessary factor in meeting the demands of the high-priced trade.

Dates are produced commercially from seedling palms in three countries—Mexico, Spain, and India. In all the rest of the world, including all regions which have any appreciable influence on the world's commerce in dates, commercial production is solely by means of offshoots. An examination of conditions in various countries, then, should form a reliable guide for American planters.

“Everywhere in Mexico,” says W. T. Swingle,* “date culture is carried on in the most primitive manner, seedlings being everywhere grown, and the propagation of superior varieties by offshoots nearly or quite unknown.” He concludes that as far as Americans are concerned, “even the growers of

*In Bul. B. P. I. No. 53, p. 135.



SEEDLINGS IN CALIFORNIA

It is sometimes convenient to plant date seeds in flats, where they can be started with a minimum of time, labor and water.

second-class and ordinary dates have no cause for alarm," because "at present the inferior and badly packed seedling dates produced in Mexico are the poorest that reach our markets, and are of no importance whatever."

Conditions are similar in Spain. No dates are exported, for the reason that they are not fit for export. Scarcely two palms can be found that bear fruit alike, and the general bad quality of it is by no means wholly due to its climate. Although Spain might easily grow all the dates it needs for its own use, if the industry were on a scientific basis and only desirable varieties perpetuated, it actually imports large quantities of offshoot-grown dates from the Tafilalet oases of Morocco, which supply all the choice trade (at about twenty-five cents a pound), while the local seedlings are sold at two or three cents a pound, and find a difficult sale even at such prices.

In India the industry is of very little importance, the dates produced being small in quantity, and being mainly sold in the villages where they are grown. Practically all the dates on the market are imported from the Persian Gulf, where the trees are all grown from offshoots, and D. Milne, director of date growing experiments in the Panjab,* says that the best of the native fruit is inferior to the worst of the imported. A generation ago a movement was started to make India a great date-growing country, through seedlings. Many of these were grown, but the results were so unsatisfactory that this has been given up, and the government is now devoting all its energies to the production of palms from offshoots, for which purpose large quantities are imported from Busreh each year.

*Bul. Panjab Dept. of Agriculture, 1912.

The important date-growing countries of the world are Arabia, Mesopotamia, and North Africa, including Egypt, Tunisia, Algeria, and Morocco. In every one of these regions propagation, unless by accident, is solely from offshoots, which are taken from palms of recognized merit.

Experience of centuries, then, has led to the same result in every part of the world where dates can be grown. It has proved that high-grade dates of uniform quality can, under existing circumstances, be produced only by offshoots, and that the plantation of seedlings for such a purpose is not practicable.

To this experience of native growers is now added the testimony of modern scientists, who are not swayed by theory or misled by incomplete observations in practice. These men have surveyed the entire field, have gathered all the evidence available, sifted it, weighed it. Some of the greatest living scientists have devoted their attention to the subject. They are unanimous in agreeing that the planting of seedlings with the idea of growing dates for the fancy trade is inadvisable. So far as the records show, there is not a scientist of established reputation in the world today who advocates the planting of seedling dates, under the present circumstances, for the purpose of producing high-class fruit.

The testimony of the rest of the world, then, is unanimous. But in the United States, during the last ten years, large quantities of date seeds have been planted, under better conditions than have ever before been furnished. If seedlings could be successful anywhere, they would be in the United States, where time and expense have been lavished in order to give them a chance to do their best.

Has there been anything in the history of this work to change the verdict of science? Careful survey of the entire field shows that there has not. The seedlings, under perfect conditions as regards planting and cultivation, have indeed distinguished themselves in various ways. They have been made to grow faster, to flower sooner, to bear fruit earlier, than anywhere else. But the fundamental difficulty, that of their variability, remains, and there is no evidence to prove that it has been diminished in any way. Only one thing can diminish it—the scientific breeding of a pure race.* American enterprise has already undertaken this, but it will require many plant-generations to accomplish the result desired. When that time comes, seeds will be available that will probably perpetuate the parent with fair accuracy. But that is merely a possibility of the future, and as far as the present commercial production of choice dates is concerned it has absolutely no bearing.

There are, of course, many seedlings which bear excellent fruit. Obviously, it is scientifically possible for a seedling to be better than its parent; but it is scientifically probable that it will be worse. All the varieties now in existence in the world are probably the result of the isolation of a chance seedling and its subsequent perpetuation by offshoots, and the creation of such new and improved varieties will go on in the United States just as much as, or more than, it has in other parts of the world. But this is purely an idealistic matter from a commercial point of view, because of the long time necessary to multiply a variety which starts as one tree. The commercial

*Because, of course, the variability of seedlings is due to cross-pollination through centuries. From this it results that soft date seeds may even produce dry dates, or vice-versa.

grower of today does not want to work solely for posterity. Such work is properly a side issue with private growers, or a field for state or governmental experimentation.

The commercial grower who plants seeds on the theory that he will get a new and improved strain is merely starting where the Arabs did a thousand years ago. There are already many good varieties of dates in the world. The man who grows palms by taking offshoots from these is capitalizing the experience of centuries. Instead of working for the future, he is letting the past work for him.

An examination of various plantations of seedlings in the United States gives no indication that these can produce dates to compete with the choice product of offshoots from palms of world-famous varieties. The best that advocates of the commercial planting of seedlings claim is that 10% or 15% of the trees may be good—and note that the claim is, good, not good and uniform. Seedlings, indeed, offer an excellent opportunity for the rancher to grow dates for his own use. If he plants them as a windbreak, or as a hedge around his field, his expense will be little, the land occupied will be of small value, and he will have plenty of dates which are good to eat.

But the dates from ten palms may all be good, considered separately, and yet if they differ each one from the other, they can not be graded and sold at the top market price, no matter how good they may be.

That is the situation which faces the man who plants seedlings for commercial purposes. He must expect to confine himself to the lower priced trade; and it is not from this trade, but from the fancy trade, that large profits are to be made. This fancy, profit-



PAINTING OFFSHOOT BASES

A coat of white lead or asphaltum is a desirable precaution before palms are shipped or planted.

able trade will be open solely to the grower whose dates are uniform—and that means the grower who plants offshoots.

There is one particular way in which seedlings can be of value to the commercial grower, although not in the form of immediate cash returns—that is, as a school of experience. If he has a quantity of seedling dates he can experiment as much as he likes in transplanting, cutting offshoots, striving to increase or decrease the production of offshoots, handling the pollen, and in many other fields where there is still much to be learned; and he can do this without feeling that he is losing money by injuring a profitable crop. Furthermore, he will be certain to have an abundance of pollen whenever he wants it. And if among his seedlings there is one of exceptional merit he can proceed to the propagation of this by offshoots, with the idea of eventually getting enough of this one variety to make a profitable planting; or he can sell the offshoots in areas which are now under quarantine against the scale diseases, because seedling palms and their offshoots are usually free from disease if they are reasonably protected from infection. From his seedlings, too, he will have plenty of fruit for his home use, since for that purpose it makes no difference whether it is uniform or not, as long as it is eatable. No one, therefore, can afford to neglect seedling dates, any more than he can afford to depend on them; but as Swingle says,† “Any proposal to grow seedling dates alone on a commercial scale as a source of profit is, to say the least, premature.”

It is not necessary to insist on the practical dis-

†Swingle, W. T. The Present Status of Date Culture in the Southwestern States. U. S. Dept. of Agr., B.P.I., Circular No. 129, p. 6. Washington, June 7, 1913.

advantage of the equality of sex which comes from planting seeds—the drawback is too apparent. One must wait several years before his palms bloom, and in the meantime he is caring for fifty or sixty males out of every hundred palms—males which he will destroy as soon as he can detect them, but in the meantime all must be watered, fertilized, cultivated alike. Let us take a concrete instance: A. and B. start date plantations at the same time, the former with one hundred offshoots, the latter with one hundred seedlings. At the end of five years A. is getting a profitable crop from every one of his hundred palms, while B. has thrown away fifty or more males and thirty or forty of the remaining females, and is ruefully contemplating the mixed quality of the rest. The knowledge that his dates are good to eat does not compensate him for the fact that the product of his twelve or fifteen remaining trees is too diverse for anything but low-priced trade.

In practice, of course, B. would partly overcome this handicap by planting a very large number of seeds; yet the principle holds good. And in addition, every palm planted means so much more expense in cultivation, as well as the value of the ground which it occupies until it is dug up and thrown away.

I alluded to the possibility of breeding a strain of dates that will come fairly true to seed. This is a field in which there will be a real future, but as it is not likely to be entered by the commercial grower, it is hardly worth while to dwell on it at length. The United States Department of Agriculture and the University of Arizona staff have undertaken to breed

a pure race of Deglet Núrs,* and a good start has already been made, but it will require a number of plant generations to fix the type, and it must not be assumed that because a seed is nearly pure Deglet Núr on both sides, it will be exempt from a tendency to variation; neither can the undesirable preponderance of males be eliminated. While planting pure-bred seed will give far better results than planting ordinary seed of mixed parentage, yet it will never take the place of a sexual propagation—in this case, by offshoots—as the best way to multiply date palms.

At present this is mere theory, for although the purification of the one variety, Deglet Núr, has been started, it is by no means finished. Nevertheless, anyone who desires to plant seeds at the present time should certainly take advantage of the work that has already been done, providing he wants Deglet Núr seed, by securing seed from the Bureau of Plant Industry.

Dr. L. Trabut, Algerian government botanist, considers that Deglet Núr in some Tunisian oases has been unknowingly inbred until the strain is much purer than in Algeria, and likely to give better results when planted from seed. The same is probably true with regard to the Fardh dates of Oman, since their culture is confined to a few oases where they largely predominate, and it is therefore likely that males in use will be seedling Fardhs, rather than seedlings of some other variety. The results obtained in growing Tafilalet dates from seed give reason to believe that Majhúl has been inbred there until it is purer than

*Mason, Silas C. Date Growing in Southern California. Report of Thirty-fourth Fruit Growers' Convention, p. 170. Sacramento, State Printing Office, 1908.

most dates. But in planting seeds of ordinary commercial dates one takes the maximum risk of getting unsatisfactory results, since the males from which they are pollinated are usually chance seedlings, and likely to be seedlings of inferior varieties, usually dry dates, which have been dropped by natives.

As occasional brilliant results achieved by seedling dates in the United States have caused the larger percentage of failures to be overlooked, it is worth while to quote the observations of some of the scientists who have given the subject critical study.

J. Dybowski, former superintendent of the Jardin Colonial, Paris, says in "*Traité Pratique des Cultures Tropicales*," Challamel, Paris, 1902, vol. I, p. 493:

"The date palm is multiplied with great facility by means of seeds, which germinate readily as soon as they are placed in contact with the soil. But the plant, because of the antiquity of its culture, possesses an extreme variability, so that, no matter how much care is used in selecting the seeds, one is never certain that he will not see the plants retrograde toward a more primitive type and, later, give only worthless fruits. We must, then, consider that this means of propagation should be entirely abandoned in actual practice, and that no one should hope by it to transplant to a new locality the culture of this tree."

Dr. George Schweinfurth, explorer and most famous of modern botanists in Egypt, in *Gartenflora* (Berlin), vol. 50, pp. 506 ff:

"All date palms grown from seed give results of the highest degree of uncertainty in respect to the transmission of desirable characteristics. In addition, the majority of the seedlings are of the male sex. The young offshoots, growing at the base of the trunk,

alone guarantee the purity of the race and especially (the identity of) the sex."

Text Book of Egyptian Agriculture, published by Department of Agricultural and Technical Education, Ministry of Education, Cairo, 1911; Ed. by G. P. Foaden, sec.-gen. Khedivial Agr. Soc., Cairo, and F. Fletcher, principal of the School of Agriculture, Gizeh:

"Dates are propagated either by seed or by suckers. As with most other fruits, dates do not always come true to seed, hence the only sure way to obtain good dates is to obtain suckers from trees of established excellence. Propagation from seed is of little value when we desire to obtain dates of the same quality as those from which seeds were obtained, or when we wish to obtain a correct proportion of male to female trees. Again, seedling palms are usually poor, and much later in maturing their fruit. Generally the fruits from such trees have large seeds and little flesh."

Woodrow, the acknowledged authority on horticulture in India at the present day, says in his "Tropical Gardening" (1910), that he planted seeds of good imported dates of known varieties; of the resulting palms a few were good, but the rest he could not distinguish in any way from *Phoenix sylvestris*, the wild date palm of India, the fruit of which is worthless.

Dr. E. Bonavia, the pioneer authority on date culture in India, says in the Indian Agriculturist for May 16, 1885, "In the Lucknow garden alone there are upwards of 252 seedlings, varying from twelve to thirteen years old, and I am informed that there are hardly two alike."

W. T. Swingle, "The Date Palm," Bul. No. 53, Bureau of Plant Industry, Washington, 1904, p. 18:

"Date palms may be grown from seed, and are generally so grown in Mexico and India, but if so propagated something over half the palms are males, which produce no fruit whatever, while of the remaining female plants probably, on the average, not more than one in ten produces good fruit. This would mean that in planting one hundred seeds, on the average only four or five palms bearing good dates would be secured, and probably as many more of second quality, or in all some 10% of the number planted would yield edible fruit. It should be said that in Arizona, and even in Mexico, very many of the seedling sorts do not reach maturity because of the insufficient summer heat; but if grown in the Salton Basin, where all the sorts could mature, a larger proportion, perhaps 15%, would produce fruit that could be used."

Ibid., p. 20:

"The seedlings of a single sort of date may present the most remarkable variations, and usually the parent type is not exactly reproduced by any of the offspring. This is clearly shown by the experiments of Col. Sam Taylor, of Winters, Cal., who tried to propagate from seed the valuable, early-ripening, Wolfskill date on his place. This was done because the palm had ceased to produce offshoots before its value was recognized. Many of these seedling dates have fruited, but none resembles in the slightest degree the parent variety; most of them are much later and consequently fail to mature at Winters, where the summer heat is insufficient to ripen any but the earliest sorts."

David Fairchild, "Persian Gulf Dates," Bureau

of Plant Industry Bul. No. 54, Washington, 1903, p. 20:

“There are thousands of seedlings called ‘degal’, but these form a small proportion of the plantations and are recognized as bearing inferior dates. The market demand is for special uniform qualities, and these seedling dates are excluded because of their variability.”

Ibid., p. 21: “There are hundreds of varieties of dates in the Persian Gulf region, nearly every seedling being more or less different from its neighbor.”

D. Milne, Economic Botanist to Government of the Panjab, in charge of date culture there and the recognized modern authority on the subject in India, in a letter to me, dated October 24, 1912:

“Regarding propagation of date palms by seeds as compared to propagation by suckers, there is in my judgment no room for two opinions. I wish you had had time to go to the western side of the Panjab with me. There are many excellent examples there of the stupidity of the propagation of date palms by seed. There I could have shown you thousands of date palms grown from seed, and which produce dates only fit for feeding to goats. Growing side by side with these are date trees propagated from suckers, and which yield most excellent dates. We have also here trees grown from the seeds of excellent Arabian and Egyptian fruits, and these in many cases yield fruits of the most inferior kinds.”

Dr. L. Trabut, botanist of the government of Algeria, and the recognized authority on North African botany and horticulture, in written statement given to me at Algiers, May 23, 1913:

“Theory and practice show that fruits grown from seed under ordinary conditions do not come true, because of the cross pollination that has taken place, usually during the course of many generations. For this reason, date seeds selected indiscriminately, even though they be from fruit of one variety, can not be expected to reproduce the characteristics of the female parent.

“Theory and practice also show, however, that it is possible to breed a pure variety of any fruit, so that it will perpetuate itself by seeds and each generation will be fairly true to type. This has been done in the case of the Reine Claude prune, in the case of Algerian oranges, in various grapes and elsewhere. It is not a work that can be accomplished quickly, and in the cases mentioned the process of purifying the strain has been going on for years, perhaps centuries.

“The same process can be applied to dates. If a male of known origin is selected, and then a female of the same variety pollinated with this, the process being repeated in each generation, the foreign characteristics will finally be bred out, and the race will be nearly true from seed, although there will still remain the commercial disadvantage that half of the seedlings will always be males.

“When such a pure race has been produced, the production of seedling dates will have great possibilities from a practical viewpoint. At present, however, with seeds taken from ordinary dates of known variety but unknown pedigree, satisfactory commercial results can not be expected.”



BAGHDAD DATE GROWER

At his side is the huge chisel used for detaching offshoots; in his hand the sickle for cutting their leaves.

**PROPAGATION BY
OFFSHOOTS**

CHAPTER IV

PROPAGATION BY OFFSHOOTS

Ordinarily an offshoot is ready to be detached from the parent palm when it weighs from ten to twenty pounds; it will then be from two to four years of age. Alone of orientals, the Egyptians use much larger shoots, sometimes up to 600 or 800 pounds in weight. Perhaps the explanation of this is that the large ones are the only ones which stand high enough to avoid being drowned out during the annual inundation of the Nile. If the offshoots are to be shipped some distance it will still be advisable to pick those of from ten to twenty pounds, or even a little larger, as they will not dry out so rapidly, but if they are to be grown at home, much smaller ones may be successfully rooted, and with bottom heat, to be described later, an offshoot that weighs only a pound or two may make as good a growth as the larger ones. Obviously one saves a great deal of space by the use of such offshoots, as well as gaining several years in the time of the offshoot remaining on the tree.

For shipping, an offshoot with thick, short base has certain advantages, its moisture being more readily conserved; but if the shoot is to be planted out at once, the long slender type is perhaps better, since the bud is then higher out of the ground and in less danger of damage.

The shoots from a tree which has had plenty of room, a sunny location, and ample nourishment are to be preferred on account of their superior vigor. Arabs carefully avoid those from a tree which is crowded in

among others and surrounded by a secondary culture, particularly if that be fruit trees, and their dislike to offshoots grown under such conditions seems to be well founded.

They also make it a point to choose offshoots which have grown from the ground and developed a root system of their own, but experiments in California indicate that in this case they err. Offshoots which have grown on the side of the tree, several feet from the ground, and are quite without roots, have given as good, and often better, results when planted. If roots are formed in the ground by an offshoot when still attached to the parent, it seems that they do not grow after the shoot is detached, but that an entirely new system must be thrown out.

Most offshoots are bent or curved, but readily straighten out when planted. Those which are unusually distorted should be rejected.

The best time to cut and plant offshoots is a matter of dispute. Of course the operation should not be carried out in the hottest or coldest weather; and if they are to be planted in the open ground, spring is certainly the best season. In California May or early June are to be chosen. But fall planting gives fairly good results in most climates, and in Oman, where the winters are mild, it is the rule, as it also is in India. If the offshoots are to be rooted with bottom heat, fall is a desirable time for work in America, as shoots will be rooted during the winter and can be set in the ground as soon as it gets warmed through in spring, thus having as long a growing season as possible.

To detach offshoots, a specially made tool is desirable, in the shape of a large and heavy chisel

with a handle two feet long and a blade at least three inches wide. It should be kept sharp. A curved blade, like that of a big gouge, is an advantage. Any blacksmith can make one. Those who have large quantities of offshoots to handle should have a series of such chisels with blades of varying widths from two to four inches. A heavy mallet will complete the equipment for cutting the offshoots; but a sharp knife or sickle must be available to trim off the leaves, and if the offshoots are growing from the ground, a shovel and mattock will be needed.

The leaves of the offshoot should first be cut back, to make the work easier; then the dirt around its base should be removed, if it is in the ground. Two men are necessary to remove an offshoot properly; one of them bends it down and away from the palm, while the other cuts it loose with the chisel. There is little danger of cutting too deeply into the palm, but there is a good deal of danger of cutting too deeply into the offshoot; therefore the chisel should be driven well in and the shoot brought out with as long a base as possible. An offshoot with a well-formed butt is often found to be attached to the parent only by a slender ligature; this is not only the easiest kind to detach, but the best to grow.

After the operation, the incision in the parent tree should be painted over with tar, white lead or something similar, and earth piled back around the base, while the offshoot is placed in the shade to dry for a few days. The exact length of time will be determined by the condition of the ground from which it was taken, but there is little danger of getting it too dry, while if it is planted when too full of moisture

it is pretty certain to ferment when it is placed in the ground.

As soon as taken from the tree, the base of the offshoot should be trimmed up with a chisel, so that the cut surface will be clean and smooth, and when dry it should be painted over with white lead (thinned with linseed oil) or asphaltum roofing paint, or better still, a mixture made as follows:

Take two pounds of linseed oil and two of suet; boil them together and stir in three-quarters of a pound of red oxide of lead.

In another vessel boil two pounds of rosin, powdered, and an equal quantity of ordinary carbonate of soda. When these have been mixed, pour the compound into the first vessel, containing the fatty mixture, and stir them thoroughly. A very large pot should be used, as the compound boils up rapidly.

Put the mixture aside to cool; if it is thicker than is desired a little denatured alcohol can be stirred into it. If it is too thick when wanted for use, because of cold weather, warm it slightly.

Being of an oily or fatty nature, it is absolutely waterproof, while the rosin makes it dry very rapidly without soaking into the fibres of the tree.

Dead leaf stalks, long roots and loose fibre should be cleaned off, and the leaves trimmed back to a length of a foot or less, and their cut ends painted over to prevent excessive radiation of moisture when planted; the shoot is then ready to go into the ground; but if it is to be shipped some further precautions are necessary. In the first place, the leaf stalks should be firmly wired together, to prevent any possible damage to the terminal bud. The wire is, of course, removed when they are planted. Then the base of the offshoot should be dipped in puddled mud and surrounded by sphagnum moss or the fibre of the palm itself. The whole base of the offshoot is then sewn in a burlap jacket, and it is soaked thoroughly. Offshoots are

best shipped in open crates, where they will get full ventilation; otherwise they will mould on the road; they should, of course, be kept away from engines and other sources of heat, and protected from rats. On a long voyage the moisture should be renewed as necessary, either by dipping the bases of the shoots in water or, if it cannot be done otherwise, merely by turning the stream of a hose through the interstices of the crate, (the leaf stalks, wired together, will keep water from reaching the terminal bud.) The offshoots should be kept slightly moist throughout their journey, if possible, but the danger from too much moisture is much greater than that from too little. The great peril is rotting. Good results have been had, when offshoots were brought to California during the summer, by letting them finish their journey in an iced refrigerator car, at a temperature of 50° to 60° F. They arrive firm and fresh, but should be dried out carefully.

Success has been obtained in some instances when offshoots were shipped dry, packed merely in straw, even on such a long journey as from Algeria to California. Nevertheless, this method can not be recommended.

Before the offshoot is planted, it should be dipped in a cresol solution (as described in the chapter on diseases) to free it from the bacteria of decay. When a long shipment is made, it would be better if the offshoot were dipped before it is packed.

The present requirement in the United States is that all offshoots shall be planted in nursery rows for the first year, so that the horticultural quarantine authorities can keep them easily under control. This method has some advantages, economizing space,

water, and labor in cultivation and irrigation. The Fardh date growers of Oman, who are the cleverest Arab cultivators I have seen, habitually follow the same practice. Elsewhere it is the custom to plant offshoots in the position which they are permanently to occupy. If any quantity of offshoots is to be planted I recommend the plantation in nursery rows, but where only a few are to be added to an existing plantation, or the gaps in the latter to be filled, it will be an advantage to put the offshoots in their permanent locations from the beginning, where quarantine restrictions permit one to do so.

Arabic authorities go into great detail on the proper method of planting offshoots. Faqír Amin al Madaní advises that a hole a yard square and equally deep be dug, and ashes be mixed with a third of the dirt removed, which is then put back in the excavation. The shoot is planted, and one-third more of the earth put upon it. After it begins to grow the remaining earth is added in light layers from time to time. In general the Arabs never use manure or other fertilizer in planting offshoots, and their practice is doubtless correct, unless in special cases where the soil is lacking in some element. A common practice is to place the base of the palm on a handful of small stones: it is thought that this makes the roots spread out more widely and draw more nourishment from the soil.

The shoot should be planted to the depth of its greatest diameter, or a little deeper in case it is long and slender; but the terminal bud must always be kept high and dry, for if water gets access to it it will be scalded or rot. The bulb of the offshoot should be set perpendicularly; if the stem is then leaning, it



WRAPPING OFFSHOOTS FOR SHIPMENT

The last stage of packing is to sew the palm in a wrapper of burlap. Photograph made at Biskra, Algeria.

will soon straighten up when it begins to grow. If planted separately the offshoots should have small basins dug around them to receive the irrigating water; if in rows, a furrow on each side will serve the same purpose. The principle to be borne in mind at all times is that water must be kept away from the terminal bud.

A new method of planting has been tried at Sacaton, Arizona, with success. The offshoots are set to the usual depth, and then well wrapped with burlap, around which earth is piled to make a conical mound, nearly to the height of the terminal bud, which is protected by the wrapping. Water is then given in a basin of ample size at the base. The theory underlying this innovation is that the mound of dry earth around the stem retains the heat of the sun and retards the lowering of temperature of the shoot at night.

If shoots are set out in nursery rows they should be three feet apart, at least, and the rows four or five feet apart. If in permanent form, I consider that thirty-three feet apart each way, or forty to the acre, is ample distance; most have been planted in the United States fifty to the acre, and the Arabs often get one hundred on the same space of ground. Even in the best Arab plantations, they are rarely planted more than twenty feet apart, but the Arabs recognize, in theory at least, that this is a shortsighted policy. Faqír Amin says, "It is bad for each palm to be planted less than ten meters (about thirty-three feet) from the other, and it has been proved that palms closer than this yield only a small amount, and if you have fifty palms and plant them far apart and one hundred palms and plant them closer, the fifty will yield more

than the one hundred." In cases where it is desired to grow a secondary crop permanently, the palms may advantageously be set still farther apart—for alfalfa, twenty-six to the acre might not be too few.

The ground should be thoroughly soaked several times in succession before the shoots are planted, and after that it must be kept constantly and evenly moist. This irrigation of offshoots is, indeed, probably the most delicate and laborious part of the whole culture of the date, and on the unremitting care given to it all future success depends. The rootlets of the offshoots are extraordinarily delicate, and if they are allowed to dry out even once during the hot summer, heavy loss will result. Their delicacy also makes it essential to avoid giving the offshoot any shock which may break them, either by plow or animal when cultivating, or by shaking the top of the palm to see whether it is sound, as anxious growers sometimes do.

No general rule can be laid down for watering, as it depends entirely on the nature of the soil. While it should be kept moist, it must not be kept so saturated as to prevent the air from getting in. In the heavy clay of Baghdád one watering a week is enough; in the light sand of some parts of the Sahara the shoot is watered daily for the first forty days, after which the supply is very slowly tapered off. In Coachella Valley every other day or every third day will ordinarily suffice; sometimes it works well to water for two successive days and give none on the third. The soil must be kept in a good state of cultivation.

It is customary to give the shoots some shade during the summer, by tying old palm leaves, corn

stalks or something of that nature around them, but it is doubtful whether this is necessary. In winter, however, they must have some protection in a climate where any frost is to be expected, as the young and growing offshoot is naturally far more tender than the adult palm. Probably the best and simplest shelter is made by tying a piece of burlap or gunny-sacking loosely around it.

Signs of growth will frequently be shown in two or three months' and, if the shoots are planted in spring, half of them should give evidence of vitality before fall; most of the rest will come into growth during the following spring or summer. Sometimes an offshoot will remain entirely lifeless for a year and a half, and then start vigorous growth. There is always a small loss, even with the most carefully selected and handled shoots, but it should not exceed five or ten per cent. If it is more than this the blame is usually due to the cultivator and not to the offshoots. Stands as high as ninety-eight per cent. have been secured with imported offshoots in California; on the other hand, some plantations have been practically wiped out as the result of a little neglect on the part of their owners. The Arab gets similar results, according to the care he uses, but as he is usually negligent he does not ordinarily get more than sixty to eighty per cent. stand.

If properly cared for, most varieties will produce the first blossom in two or three years. Varieties differ: Khadhráwí is one of the earliest, and ordinarily produces its first fruit in three years, even under Arab management, while Awaydí seems, with the best of care, unable to give results before eight or ten

years. In any event, it is a great mistake to let a palm bear fruit too early.

Offshoots are frequently found which have small offshoots upon them, and there is no reason for detaching these and destroying them, unless one cares solely for fruit. In the United States, the production of offshoots from the best varieties promises to be fully as remunerative in the immediate future, as the production of fruit. It is not possible to get a maximum production of both from the same palm, but most growers will doubtless prefer to keep the fruit yield to a reasonable limit by cutting off surplus blossoms, in order that they may secure as many offshoots as possible. Offshoots may yield a few offshoots, in their turn, at three or four years from planting, and at from five to fifteen or twenty years of age they should yield at least two a year, although varieties differ in offshoot production. From an eight year old Birket al Hajjī palm at Tempe, Ariz., fifty-three were taken at one cutting.

The Arabs long ago discovered that if all the offshoots were taken from a palm it would produce no more, and this fact has been confirmed in the United States. It is necessary, then, to leave one or more offshoots on the tree at all times, so that it may continue to produce, and if this is done, and ample irrigation and fertilization given, the palm may continue to produce offshoots much longer than is supposed—even to the age of thirty or forty years. In a damp climate it seems to yield more. On the coast of Southern California, where fruit does not mature, the palm yields offshoots much more abundantly than it does in the hot interior valleys, but this is doubtless due, in part at least, to the very fact that

the fruit can not ripen, and therefore the palm is allowed to devote its whole energy to reproduction through suckers.

If it is desired to get as many offshoots as possible, the grower should keep the leaves on all of them cut well back while they are still on the parent palm. The energy thus saved to the tree will be used to grow more offshoots.

So far the discussion of offshoots has assumed that they are to be grown in the open ground, but experiments made in California have shown that the application of bottom heat will give higher percentages of success and much quicker results, saving from three to six months in the time necessary to root an offshoot. The method may never be practicable for handling a large shipment of offshoots, but for ordinary purposes it seems likely to supplant outdoor propagation altogether.

Credit for the development of this method is due to Bruce Drummond, in charge of the U. S. Department of Agriculture Experiment Station at Indio, Cal. It has only been tried for one season, but the results have been almost perfect.

Offshoots are set closely together, either in a bed of ordinary sandy loam or in pots of the same material, over a coil of pipes carrying hot water, in such a way that the soil around the roots is kept at a temperature of from 100° to 110° F. The difference will be realized when it is known that the soil temperature in Coachella Valley rarely exceeds 80° or 85°, and that up to the middle of May it does not rise above 55°. The heat is kept constant night and day, moisture abundantly supplied, and within a month or two the offshoots usually begin to grow; roots seven inches long were

found on one after only five weeks in the bed. When the rooting is once started, it is probable that the temperature could be increased even to 150 F., and the growth forced still more rapidly. As soon as they are well rooted they can be transferred to the open ground; and it is likely that four batches a year could be run through the plant in this manner. The smallest offshoots can be handled successfully; one of seven ounces has succeeded, and small size would be particularly desirable because of the greater economy in pots. It has been found in actual practice that a small offshoot produces fruit as soon as a large one does, in most instances.

Mr. Drummond operates in a greenhouse with glass roof, but considers this a disadvantage rather than an advantage, as it keeps the top temperature too high, and tends to stimulate leaf growth at the expense of root growth. The plant could best be established in a well lighted building which could be easily opened to a free circulation of air when desired; a canvas house, or a lath house with the laths set rather closely together, would do well. Such a plant is in reach of almost any cultivator, for a second-hand boiler and pipe are quite sufficient to carry hot water. It can be very cheaply operated, particularly in hot weather, when the amount of fuel needed is ridiculously small.

The discussion of offshoots may well be closed with a reference to the means of identifying them—a question which always interests one who buys offshoots from a foreign country, but also has its practical value to the grower in handling the offshoots of his own palms. The offshoots of all varieties differ from each other, and in some cases the characteristics

are so marked that they can be distinguished at a glance by anyone. The color and texture of the leaflets and the angle at which they are set on the midrib; the length, thickness, number and arrangement of the spines; the color of the midrib; and the amount and arrangement of the fibre among the stems, are the principal guides, and these points should all be noticed by one who wishes to fix the identity of an offshoot.* There is no reason why the ordinary grower should not learn the characteristics of the offshoots of all his palms, unless he has an unusually large number of varieties on his plantation, and he will thus be enabled, in handling offshoots, to avoid any confusion: although it is also desirable to fix a permanent metal label to them as they are cut from the parent tree.

One who buys offshoots among the Arabs follows the same method, but if the offshoots are new to him he must at first depend on Arabs for the identification. The safest way, of course, is to see the trees in fruit, and determine the characteristics of the offshoot (and the palm itself as well) at that time. But in practice he is not likely to be deceived, if he conscientiously attends to his work, for he can usually tell a strange offshoot in a bunch which is supposed to consist of one variety, even though he may not be able to give the name of the stranger—a Tafazwīn, for instance, in a row of Deglet Nūr offshoots, sticks out like a sore thumb.

If the buyer of offshoots in an Arab country employs as his field agent an Arab recommended to him by some responsible European, if he conscien-

*Prof. S. C. Mason of the Bureau of Plant Industry has worked out a complete system for identifying adult palms in this way.

tiously watches the offshoots as they are brought in, and if he calls a council of his Arab visitors from time to time and asks them to name the offshoots they see in his packing yard, he has little chance of being defrauded. As for the substitution of male for female shoots, a trick that was practiced upon the United States government in some of its first importations, it is hardly possible in the present state of knowledge, and is explainable only by the fact that these importations were secured at second hand, through consuls and others who had no idea of what a date palm was. The male offshoot, by its vigorous growth and sturdy aspect, and its larger number of closely packed leaves, is almost always distinguishable even to the beginner.

Seedling palms have also been sold as offshoots on some occasions, but it is hardly conceivable that a careful buyer could be fooled in this way, for such a buyer inspects personally the base of every offshoot as it is brought before him, throwing out all those in which symptoms of decay appear; and he can see at a glance whether the plant has been cut from a tree or grown in the ground from a seed. I have never met an Arab who tried to foist such a thing on me, and I doubt if they would try it, unless they found a man packing offshoots without any inspection. The natives of India appear to be unusually clever at such trickery. Milne says:*

“Fraudulent people often cut a piece off the lower end of a seedling to make it appear like an offshoot. A seedling plant usually has a straight stem, however, while that of an offshoot usually has a slight bend at

*Milne, D. “Date Cultivation in the Panjab,” p. 11. Lahore, 1911.



TRIMMING OFFSHOOT BASES

All inequalities should be removed from the cut surface of the butt before it is painted and packed.

its base where it curved inwards to join the parent stem. The direction of the cut with regard to the main axis of the plant and the angle at which it cuts the sap-conducting vessels of the wood also usually differ in the two cases. In the case of an offshoot the cut is made roughly in the plane of the main axis of the plant, and owing to the base of its stem bending toward the mother the cut will also be more or less at right angles to the direction of the vessels at that point. In the seedling if the cut is made at right angles to the direction of the vessels, it will be at right angles to the main axis of the plant, and if it is cut in a plane anywhere approaching that of the main axis of the plant it will not be in the proper direction with regard to the vessels, and the cut end will probably show a more or less distinctive outline."

From what has been said it will be evident that the careful buyer need be in little fear that he will be swindled; nor is the problem of packing and shipping offshoots a serious one. It calls principally for unremitting attention. The actual danger begins after the offshoot is in the ground, but here again it is not one that need alarm any except the ignorant or negligent grower, and if offshoots are rooted indoors, by the application of artificial heat to the soil, the period of anxiety will be much shortened and the percentage of success still further increased.

PROPAGATION BY SEED

CHAPTER V

PROPAGATION BY SEED

There is no detail of date growing in which the medieval Arab authors give such play to their imagination as in the handling of seedlings, and this fact strongly indicates that the growth of palms from seed was more a theory than a practice—that seeds were not really planted often enough to check up and explode the fantastic ideas of the writers. In modern literature the seed is absolutely ignored as a means of propagation—such authorities as Faqír Amin al Madaní do not even allude to it, the offshoot being considered the only means of propagating the palm commercially. When a seedling palm is found in an Arab's plantation, one may be sure that it merely grew by accident.

Ibn Awám* thinks success depends on planting the seed horizontally, not vertically, and covering it with soil mixed with manure and salt. He mentions with evident scepticism the declaration of Ibn Hajjáj† that he had grown seeds in soil without salt, and declares that all other authorities unanimously

*The Book of Agriculture by Shaykh al Fadhl Abú Zaharía Yahíá b. Muhammad b. Ahmad Ibn al Awám Ashbílí (i. e., a native of Seville, Spain) is one of the fullest and most interesting of medieval treatises on horticulture. It seems to have been written in the twelfth century, A. D. It was first published in 1802 by the royal library of San Lorenzo del Escorial, Spain, from a MS. in its possession, with a rather loose translation by Don Josef Banqueri, prior of the cathedral of Tortosa; and again at Paris in 1864, from a more perfect MS. in the Bibliothèque Nationale, with a translation by J. J. Clement-Mullet. The first edition is in two vols., the latter in three.

†Abú Umar ibn Hajjáj wrote *Al Mukna*, a treatise on agriculture, in 1073 A. D.

contradict him; whereas we now know that a very small amount of salt is sufficient to kill seedlings, for they are far less resistant to it than adult palms. Ibn Awám indeed quotes* the exact proportion for the purpose: four pounds of common salt to each two baskets of mingled earth and human excrement—the basket being the “qafíz” of Cordova.† Mahrarius, again quoted by him, thinks the important thing is to soak the seed for five days in water, and then plant it with the ventral channel downward, both of which ideas are fairly sensible. Saghrít holds that failure is due to the temperament of the planter. “Beware,” he says, “that the planting is not done by a mean person, or one with a bad mouth and melancholy humor. He should have an aspect of happiness and joy.” Other writers inform us that it is of no use for the planter to simulate joy if he does not really feel it—the seed will see through such a hollow mockery at once, and refuse to germinate. The phase of the moon is also an important factor, but as the authorities are far from agreeing as to the proper phase I need not quote them. If the germ-pore is planted downward, it is considered that the palm will be a male. I do not advise anyone to base his faith in seedling dates on this idea, or on the similar one that if the seeds are dipped in boiling water before planting, a larger percentage of them will be female.

Qastús‡ says the seed should be soaked in water

*From Abú Abdullah Muhammad b. Ibráhím ibn al Fadhl, an Andalusian Moor whose treatise on agriculture has been lost. It was written in the eleventh century.

†I suspect Ibn Awám has made a mistake here. The ordinary qafíz is a mule load, while the qafíz of Cordova is only forty-two mudd or double handfuls, and two pounds of salt in this quantity of earth would kill any seed.

‡Qastús b. Lúqá al Rúmí, *The Book of Greek Agriculture*, ch. 75.

for two days, then cut in halves lengthwise and the two halves buried side by side in the earth with the cut surface downward and in complete contact with the earth, the apex pointing toward the east. Pliny* believed that two seeds should be planted side by side and two more similarly placed on top of them, "for when planted singly, the tree that springs up is but weak and sickly, whereas the four seeds all unite to form one strong tree." The writers realized that the seeds did not reproduce the characteristics of the parent, but Ibn Awám declares that if the seeds of these seedlings are again planted, they will return to the exact characteristics of the original parent—certainly a wonderful case of atavism.

Abd al Ghaní† lays great stress on planting the seed two cubits deep, with manure, salt, and wine lees, and plenty of irrigation; "especially if the water remain on it at night will it become fat and hasten to grow and laugh with delight over its food, and its face will be wreathed in smiles. It should be protected with care from all ill treatment and watched over with anxious solicitude, being properly protected during hot weather; it should also be thoroughly cultivated, as it can not grow well if other plants are growing around its roots. If these rules are observed, the palm will grow beautifully, for what it most wants is earth and manure and salt on it and water at proper intervals."

The ancients usually advise that the seeds should be planted where the palm is to stand permanently.

*Caius Plinius Secundus, *Historia Naturalis*, Book XIII, ch. 7. Rome, 77 A. D.

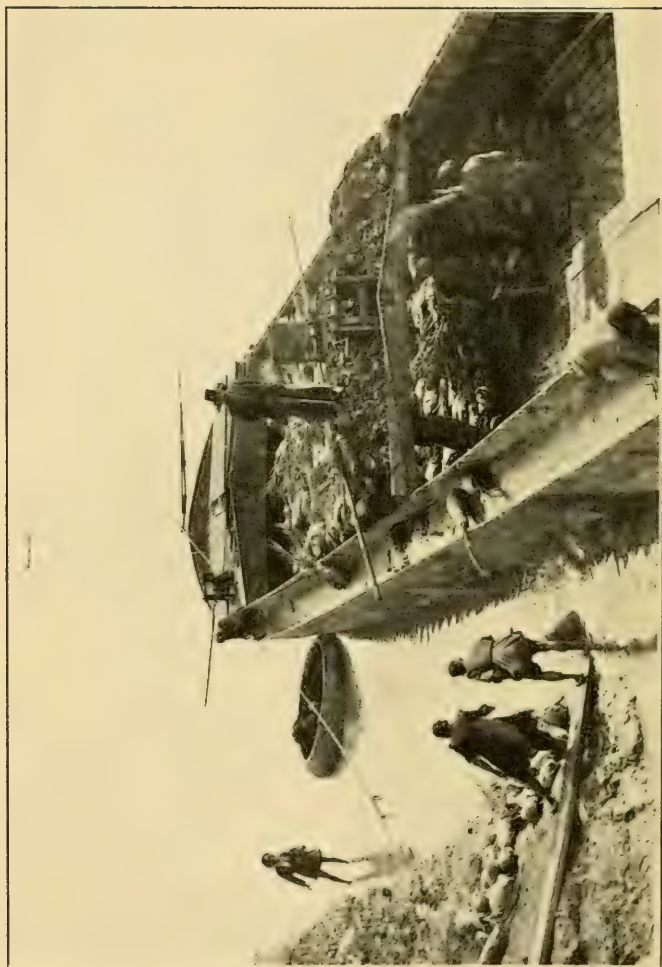
†Shaykh Abd al Ghaní al Nabli, *The Book of the Use of Salt in the Science of Agriculture* (MS. in my possession—no date).

It appears that there are niceties about transplanting, too, for the Book of Nabathean Agriculture* says success in this operation will only be attained if the grower has a lymphatic and lunar temperament, and his body is in normal condition, and even under these circumstances the transplanting would be an absolute failure should it be attempted on the second day of the lunar month. "In transplanting he should be gay and joyous, without constraint, his face wreathed in smiles; it is a thing which we have proved by experience and can recommend as being well-founded," says the author.

But let us leave the dark ages and get down to actual facts.

The modern grower who desires to propagate by seed will first of all select his seed, if it is possible to do so. The percentage of palms which come true will depend on the extent to which pollination in previous generations has been made by a male of the same variety as the parent. In the case of most commercial dates it is impossible to say what the male parent was, but there are some cases in which the chance is greater than others. Most Algerian dates, including Deglet Núr from that region, are likely to have been pollinated by a male which grew from a dry-date seed, since the latter class of dates is commonly eaten by the natives, who throw the seeds around, where one may strike

*The Book of Nabathean Agriculture is one of the most famous productions of the dark ages, in this field, and has long been a fertile subject for dispute among students. It purports to have been written in Chaldean by one Quthámí, and to have been translated into Arabic by Ibnu-l Wahshíyyeh in 904 A. D., but scholars now consider it to be a forgery of which Wahshíyyeh was the actual author, rather than the translator. The MS. (No. 175) in the Bibliotheque Nationale of Algiers, however, bears the introductory statement that it was translated from Chaldean into Arabic by Abú Bakr Ahmad b. Alí b. Qárs al Kusdání al Qaísi in the year 291, i. e., 903 A. D.



LOADING OFFSHOOTS ON TIGRIS RIVER

Preparing to ship West India Gardens' Baghdad importation to the sea for reshipment on ocean steamer.

root and grow. Therefore seed of Algerian Deglet Núrs can not be expected to produce particularly favorable results.

The Majhúl date of Tafilaleet, on the other hand, seems to give a better average of results, and this is probably because it and varieties similar to it preponderate in certain oases, so that the race has been unknowingly kept purer than usual. The same thing has taken place in the case of Deglet Núr in some of the oases of Southern Tunisia.

Fardh has given good results as a seedling. It is grown only in one valley, where two-thirds of the trees are of that variety; therefore there is an excellent chance that the male may have been a Fardh seedling.

Asharasí should give fairly good results, since the most valued male in the districts where it is grown is itself a seedling Asharasí.

But better still, one may secure from the Bureau of Plant Industry seeds of Deglet Núr which have been inbred, so the probability of their coming true to seed is notably better than those of the ordinary Deglet Núr of commerce. As the breeding process goes on, better seeds will be obtainable every few years, although it will be a quarter of a century before any quantity of seeds of an approximately pure race can be obtained.

Having secured his seed the grower will sort it, throwing out small ones, and then soak it in water for a week, in order to hasten germination. The easiest way to do this is to place the seeds in a sack or perforated can and leave it in an irrigating ditch. They may then be planted in any ordinary soil. Spring is,

of course, the proper time unless one expects to work under glass and with artificial heat.

The soil used for the purpose must not contain enough alkali to injure ordinary crops, and it will be best if it is nearly pure. California growers should select a clean, sandy loam, such as is available in many parts of the desert. Several methods of starting the seed have been found successful, and the one to be selected will depend on the grower's own desire.

Flats or shallow boxes offer a convenient method of beginning, and are particularly desirable if the grower has been a little slow in getting his permanent location ready. They may be transported easily from place to place, and save a great deal of time, labor, and water in handling the seeds during the first part of their plant life. The seeds should be planted an inch or two deep and three or four inches apart, and the soil kept constantly moist.

Contrary to Arab ideas, it really makes not the slightest difference in what position the seed is planted. If a hole is punched in the soil with the end of a broomstick, and the seed dropped in, it may be covered up without further thought.

Most American growers, however, have planted their seeds in rows in the open field. Some have even planted in the locations where the palm will stand permanently—that is twenty-five or thirty feet apart; but this requires an amount of labor and water that the ordinary grower will feel to be wasted. On the other hand, too close planting is to be avoided, as the palms then take longer to come into flower, and one does not wish to care for a lot of worthless males any longer than necessary.

From this point of view, the best planting is

probably in rows seven or eight feet apart, and three or four feet apart in the row. No fertilizer is necessary unless in exceptional cases,* but irrigation and cultivation should not be stinted. With such treatment, palms have been known to bloom as early as one year—only one rudimentary blossom, of course, but it sufficed to determine the sex. Frequently they bloom in two years, and should usually do so in three, with the rest of the palms coming into flower in the fourth or fifth year: but it must be understood that this record is obtainable only with the best of care, and when the palms are not too crowded in the rows. Under ordinary circumstances, and with most seedling plantations, five to eight years have been required to determine the sex of the palm.

As soon as the sex has been shown by a flower the males can be dug out and the females transplanted to their permanent positions. To effect this removal without the loss that has sometimes accompanied it, the palms should be given no irrigation for three weeks before transplanting. When taken out of the ground the leaves should be cut back; then if they are put in the orchard and given plenty of cultivation and irrigation they will continue to grow without any check; while if they are taken from moist rows and transplanted, those that do not die often suspend growth for from three to six months. The same precaution should be observed in transplanting seedlings from flats, and in transplanting offshoots from the hot bed or nursery row to their field location.

If the seedling palms are to be maintained as a

*A little lime sometimes seems to improve the soils of Coachella Valley, but it should be used sparingly and with discretion.

windbreak, they may be sown in the proper line, five or six feet apart, and left there permanently, for there will be no need of removing the males in this case.

The percentage of males varies around one-half. James P. Read, of Mecca, found that sixty per cent of his Deglet Núr seedlings were males. The Majhúl seeds have given a surprisingly high percentage of females, but as the number reported on so far has not been large, this may be merely a coincidence which further plantings will destroy. The grower must, in general, expect that something less than half of his palms will be females.

The grower will naturally wish to save a certain number of male palms for his own use; if they are seedlings, he should have five or six to each hundred females. The easiest and surest way to insure an abundance of pollen is to plant a windbreak, as described, and let all the males in it grow; in the number there is certain to be one or more that will give satisfaction. If the planter wishes to save only a few males, he should select such as seem to flower most profusely; but he can never be certain of good results, for seedling males are no more reliable than seedling females, and I am confident that most of the males in use in the future, in an intelligent date growing community, will be propagated by offshoots from a father of known value.

Having satisfactorily disposed of his surplus males, the seedling grower will then consider his females, and will probably plant them all in orchard form at first, leaving the elimination of worthless ones until they bear enough fruit to give a fair test of their character. This is the more desirable

because a palm grown from seed sometimes bears bad fruit during the first few years and afterwards improves in quality—a characteristic that applies also to a few varieties of offshoot-propagated palms, and particularly to Manakhír in the United States. As rapidly as he decides that a palm has no merit, he will throw it out and put in its place an offshoot from one of his better females; and this process he will have to continue indefinitely, if he wishes ever to get a really valuable commercial plantation. So when the seedling grower finally gets a good grove of palms, he will have to admit that it is not really a seedling grove, but preponderatingly an offshoot grove.

It is difficult to quote any figures as to the percentage of good seedlings in one hundred female trees, for the number will vary according to conditions, and no figures quoted are safe from attack by someone who can show that in his own experience they are inaccurate. Most students* consider that one-tenth of the females will bear fairly good fruit and another tenth passable fruit: that is, from one hundred seeds (including males) one would get ten females which would produce eatable dates. In favored localities the number would be a little higher, but the commercial disadvantage always remains that even the good dates are too varied to be graded and packed as a uniform product, and therefore can not command the top market price. For home use, where it makes no difference whether the dates are uniform or not, seedling fruit may be quite as good as that grown from offshoots.

There remains always the attractive possibility that the seedling grower will draw a capital prize—

*e. g., Swingle and Milne.

that he will produce a palm a little better than anything else. The chance is too good to neglect, and every date grower should have as many seedlings as he can care for without detriment to his profits, but a slight consideration will show that the chance is, arithmetically, not very great. It is true that all the varieties in the world have been produced from seeds, but the small number of high grade varieties, which is most noticeable in the very districts where propagation is by seed instead of offshoots, shows that such an occurrence is rare. It is only once in a century that a Deglet Núr, a Khalásch, a Tabirzál, or a Birket al Hajjí appears; and although some choice seedlings have already been produced in the southwestern United States, an honest examination of them will show that they are no better than, and in most cases inferior to, good varieties which we have already imported from the Arab world.

The greatest opportunity of the seedling grower lies in the rapid production and propagation of offshoots. If from a thousand palms he gets a few that are of good quality and reasonably uniform, he can, after they have proved their value by one good crop, force them to devote their whole energy to the production of offshoots, which he will remove while still small, and root with bottom heat. These in turn will produce offshoots in four or five years, and the multiplication of the variety, or the similar varieties, will then go forward with some speed. Such work offers a legitimate field, but it is of necessity one that will attract the nurseryman more than the grower whose aim is to acquire, as soon as possible, a plantation of dates that will yield him a steady income.

CULTURE OF THE PALM



NURSERY OF 13,000 IMPORTED OFFSHOOTS, AT THERMAL, CALIFORNIA
More palms were brought to the United States in 1913 than in the entire previous history of the industry.

CHAPTER VI

CULTURE OF THE PALM

Irrigation is the principal item in the culture of the date palm. For Arabs it is practically the only item, for in most gardens the palms get no cultivation whatever, unless incidentally through the presence of a secondary crop; or, once in a year or two, when a little manure is worked around the roots. It is therefore irrigation that the scientific date planter must first of all consider, and to which he must constantly give his attention.

I have already mentioned that a water supply of one miner's inch to the acre is desirable except on land which holds water particularly well, but there is some difference of opinion as to the way in which this should be applied, and every grower will have to decide for himself by watching the condition of the ground. One plantation, on very sandy soil in Coachella Valley, gets twenty-four hours of irrigation twice a week and thrives on it; another, in loam, gets water only once in eight or ten days and seems to be in equally good condition. As most date growing countries are characterized by a relative scarcity of water, the grower may naturally like to give more than is necessary, but I may say at the outset that it is easy to give too little, but almost impossible to give too much. It has already been mentioned that the plantations of Busreh are irrigated every twelve hours. The experimental garden at Tempe, Ariz., is in a locality where the level of the ground water is near the surface, and often above, but the palms

have never given any signs of a surfeit in their growth, although excess of water has a very bad effect on the crop itself.

On the other hand, cultivation will take the place of irrigation to some extent, by keeping the water in the soil after it is once put there. The Arab neglects this because of his indolence, but the scientific grower can not afford to do so. As with irrigation, there is no danger of giving too much cultivation, but there is danger of giving too little.

It is impossible to give advice that will fit all conditions, but I believe that on ordinarily good soil a thorough irrigation once a week, followed by cultivation as soon as the ground is dry enough to work, would be ideal throughout the summer. In lighter soil, unless the subsoil be of such a nature as to retain water well, I would certainly irrigate oftener. In winter the interval can be lengthened, particularly as most palms lie nearly dormant for some time, and advantage can often be taken of timely rains. It has sometimes been advised that irrigation should be suspended during the winter because it would tend to make the palms more sensitive to frost, but observations in California following the cold weather of January, 1913, indicate that this theory has little importance in practice. If irrigated well in late winter, palms will flower earlier, and thus fruit earlier—an advantage well worth gaining.

Americans usually suspend irrigation for a few weeks while palms are being pollinated, on the ground that a better stand of fruit will be secured, because moisture will cause the blossoms to drop before they set. In theory this seems plausible, but in practice it will be found that most Arab growers do not observe

it, and they suffer no inconvenience. At Baghdád the period of flowering is frequently the period of inundation from the Tigris, when plantations are submerged to the depth of a foot or two for several weeks; and the growers nevertheless get a heavy crop of fruit. It may be a safe precaution to omit one irrigation immediately after the female has been impregnated, but in a dry climate and porous soil I doubt if it has any advantage.

It has also been advised to suspend irrigation when the dates are nearly ripe, in order to keep them from becoming soft and sticky. This again sounds reasonable, and for some varieties is desirable, but other varieties demand an increase rather than a decrease of water at this period. In Coachella Valley, for instance, Deglet Núr dates show a tendency to shrivel or mummify toward the end of their ripening on the tree, just at the time when they should be filling with honey. The climate appears really to be too dry for them. This tendency, which has sometimes caused serious loss, can be checked by giving copious irrigation right up to the time the dates are taken from the tree. With varieties which are likely to be unpleasantly soft, irrigation at the last might well be withheld. The character of the soil must also be taken into consideration. In short, the grower's own judgment and experience are essential to decide on this point, but in general it offers little trouble, and is not of importance.

It will be seen, then, that irrigation and cultivation offer no puzzling problems. The grower who gives his palms plenty of both will have little need to worry about details.

Nor does the fertilization of the land present

many questions; or if it does, the present state of our knowledge is not sufficiently advanced to permit us to know it. The future may hold some important discoveries, but at present both theory and practice may almost be summed up in two words,—“stable manure.” This is because the soil in most date growing regions is more deficient in humus than in anything else, and because chemical fertilizers are so quickly washed out of the land by the constant irrigation that they hardly have a chance to return interest on the investment their cost represents.

The Fardh growers of Oman are again most advanced among Arabs in this respect, for they work into the soil a donkey load per tree of well-rotted manure and straw twice a year. In other oriental communities once a year is considered liberal, and at Busreh once in two years is the rule, and even then the ingredient is the coarsest kind of straw and reeds, animals being scarce. The general practice is to apply manure at the beginning of winter, so that it has a chance to rot thoroughly and become incorporated with the soil before the growing period in spring; but if it is well rotted before it is applied, early spring would probably be better, as there would be less loss from leaching. It should be well worked into the soil.

If a grower knows that his soil is lacking in any particular element, he should of course supply the deficiency, as he would with any other crop. Otherwise he may as well depend on stable manure, or some other form of humus. The leaf mould found under mesquite bushes in the southwestern United States is excellent, and far too valuable to be wasted by burning, as is often done when a new piece of land is cleared. So far as I know, inoculation of the soil with

bacteria, to increase the nitrogen supply, has never been tried with this culture, but it would be well worth trying. If a secondary crop is to be grown, alfalfa or some leguminous plant should be given the preference for this same reason.

When a subsidiary crop is grown between the rows, the nutrition which it takes from the soil must be replaced unless the palms are to suffer. Ordinarily it will be sufficient to plow the crop under after it has yielded its produce.

The Arabs have some excessively fastidious ideas about fertilizers, which can not be accepted until they have been scientifically tested. Camel manure is looked on in Algeria with disfavor, as being "too hot." That of mules and donkeys is given the preference, but that of cows and horses is also considered good. Ibn Awám says that the excrement of pigs burns the roots of the palm; he also suggests that the roots should be irrigated with date syrup in order to make the fruit sweet! Wine lees are in high repute among the old masters, as a fertilizer. Faqír Amin al Madaní is, as usual, original in his remarks:

"And you must fertilize the palm, for that is the best thing to increase its yield. Cow manure or that of camels is best, spread under it in winter, but any good manure, well rotted, will prove efficacious if applied in winter. But an easier method to make it more verdant is, in the summer days, to gather all the fallen fruit and that bruised by feet or spoiled by the birds, and to put a little water on it and let it rot and save it for winter; then pour on each palm a portion of three pounds of this liquor, and in this manner there will be no expense to you, because the fallen fruit would have been a loss to you in any case."

All the medieval writers consider that the palm should be irrigated occasionally with brine. There is no evidence, however, to show that it benefits from such treatment.

Many of the talismans and charms by which the growers of antiquity professed to influence the palm are nothing more than a crude sort of fertilization. Ibn Awám, for instance, says, "There is a prodigious secret of marvelous virtue, which is to take fourteen pounds of the aromatic rush of Babylon, dig a hole in the ground and bury it; after twenty-one days dig it up and spread it on the trees" (to increase their yield.) "It must be done in the sign of Taurus or of Cancer; I myself have tried it with notable success." Obviously this is nothing more than adding a little humus to the soil. Again he says, "If your trees bear intermittently, dig a trench around them at two cubits distance and put palm leaves and branches in it; wet them five times at intervals of five or six days, after which, if it be the will of God, the tree will bear."

This intermittent bearing of the palm is a factor with which every grower must reckon. In light sandy soil, lacking in humus, it is almost impossible to get a palm to bear a uniformly heavy crop each year; old palms always show a tendency to rest every other year; while young ones in full vigor will require an entire season to recuperate if they are allowed to bear too heavily. A grower who gets a new palm into bearing, particularly if it be of a valuable variety, naturally wants as much fruit as possible, so he lets it bear a maximum crop, with the result that he has nothing at all the following season. The palm must be brought into bearing gradually: one bunch the first year, two or three the second, three or four the

third, and so on. Even after it reaches maturity it should ordinarily not be allowed to carry more than half of the clusters which it throws out. Of course, if the variety is naturally a shy bearer, and sends forth but a few racemes, it will not be necessary to remove any, but where twenty or twenty-five are put out, as is sometimes the case, ten or twelve are enough to leave. It is hardly necessary to point out that if a palm is carrying offshoots it must carry fewer dates. In the case of a valuable variety, from which it is desired to get as many offshoots as possible, it will often be well to let it bear only one or two bunches of fruit each season; the value of the offshoots will more than compensate for the dates lost. On the other hand, a second-grade tree which there is no reason to perpetuate should be stripped of offshoots altogether; it will then be able to put every ounce of its energy into the production of dates. Unless you have had enough experience to be certain of your success, leave a fairly large number of clusters until after you have pollinated and have had a chance to observe the results; some clusters usually set less dates than others and these can be removed, leaving only first-class clusters on the tree.

If the number of clusters borne each year is kept to a reasonable limit, and the palm given abundant irrigation, cultivation, and fertilization, no one need fear this intermittent bearing or alternation of years. It has been thoroughly proved in California that good care is the only thing needed to make the palm perform satisfactorily each season.

As dates are ordinarily grown in a semi-arid climate, there is little trouble from the weather. An unexpected rain in early summer will do little harm;

if it comes when the dates are ripening it may make trouble, but experience in Coachella Valley last year, when a September storm brought a precipitation of one and one-half inches, proved that most of the fears which have been entertained on this score are groundless—the total loss to the crop probably did not exceed five per cent. Of course, if rain should be followed by a period of moist days it would be more serious. This rarely occurs in a desert country; should it do so when the dates were ripening, the only recourse would be to pick the crop at once and finish its ripening artificially by the quick process. For this reason, every grower should have the means of carrying out this process.

Sometimes fruit falls prematurely from the palm as a result of bad weather; at other times it falls with no apparent reason. The trouble seems to be a question of variety, and few of the good varieties annoy one in this way. If they do, and you are enlightened, you will hunt through the plantation for a crab's leg, which some enemy may have tied to one of your palms; it is well known that this causes the fruit to fall, and to prevent such a catastrophe intelligent growers usually have a sheep's skull set on a pole in their plantations: it is a sure charm and counter-irritant or antidote. Should even this fail, the only orthodox recourse is to hang on each of your palms a slip of paper bearing the verse,* "He holds up the heavens to keep them from falling on the earth unless as a result of His will, because God is merciful and compassionate toward men." Few palms can withstand the influence of such a thought as that.

*Koran, XXII, 64.



PROTECTION FOR OFFSHOOTS

The plant is surrounded by palm leaves, to keep off frost, in an exposed situation at Busreh, Turkish Arabia.

A frost when the fruit was ripening or the flowers being pollinated might be disastrous, but such a thing is impossible in most date growing countries, and frost in winter is not serious enough to give any concern. Young trees should always be protected, but it is entirely needless to consider heating a palm garden, as orange growers do their groves. The Arab grower, when threatened by frost, places a tortoise on his back in the middle of the grove, and thus avoids all danger; but of course a man must stay beside him throughout the night, for if the tortoise should succeed in turning over on his belly and walking away, the frost would immediately descend in full force.

There is danger from wind, however, in most date-growing regions, and it is highly necessary that ample windbreaks should be planted, particularly for the protection of young palms. If one is in a sandy region, he could well afford to plant numerous windbreaks through his orchard,* of a sufficiently dense nature to stop sand when it is blown through the air; otherwise a sandstorm, arriving when the dates are soft and sticky, may make the crop almost unsaleable. This difficulty is frequently experienced in the Persian Gulf region, where a whole crop is sometimes nearly a loss; and the dates of Hasa are always and notoriously gritty.

The palm must be trimmed regularly, but it is better not to do this until it is four or five years old. After that the leaves that are actually dead or dying should be taken off each year, and the trunk cleaned up of fibre and other decaying matter which offers a refuge for borers. There is danger in trimming too

*A row of seedling dates, reinforced by a row of pomegranates, would be excellent. The latter fruit is well adapted to resisting heat, drought, and alkali.

heavily, but not in the other extreme. The growers of Egypt cut off as many leaves as possible from their palms because they find a ready sale for use in Christian and Jewish church festivals, and they thereby injure the productivity of their palms, a fact which residents of other regions do not hesitate to taunt them with. "It is," says Faqír Amin, "as if a man should shave his head, and then take off the scalp as well—what would be his condition? And what would his mother and brother say to him?" In adult palms one complete ring of ten to fifteen leaves can ordinarily be removed each year; they are useful as a frost protection for offshoots, or a shade in summer if such is desired. In Arab communities both leaves and fibre have a commercial value and are made into a great variety of products, the fibre furnishing cordage, stuffing for pack saddles, and the like, while the leaflets make baskets, and the midribs all kinds of furniture.

In general, it may be said that the culture of the palm requires less pains and less skill and study than that of most fruits, and that the expense of growing it is correspondingly less. Pollination is the only delicate operation to be performed, and that is easily learned. This is a case where the value of a supply of seedling trees on which to practice will be evident. Apart from that, the only real problems connected with date growing occur in handling and marketing the crop. As for the culture itself, anyone who has mastered the few and simple fundamental principles of farming in a semi-arid country (which, however, are quite different from those of farming in the eastern United States) can make a success of growing date palms.

POLLINATION

CHAPTER VII

POLLINATION

Since the dawn of history, artificial pollination of the female date palm has been practiced in communities where its culture was commercially important. Bas-reliefs on the Assyrian monuments plainly show the operation. Herodotus,* who wrote about 450 B. C., gives the first description of the operation, which he saw at Babylon, but he confounds it with the caprification of the fig. Theophrastus† corrected him, and describes the operation clearly and correctly; Pliny,‡ however, seems to have been a little hazy as to the principle involved.

The medieval Arab authorities understood artificial pollination, but their lack of practical experience is shown in the dubious way with which they approach the subject. Abu-l Khayr says, "The palm fecundated by the male at the time it blossoms will produce dates that are soft and juicy"—a proposition that is rather obvious to most date growers; and Ibn Awám, quoting this, adds, "I fecundated a wild palm in Al Sharaf at the time of opening the flowers, with those of a male introduced and tied to it, and dates of a good quality were produced; which operation is done only once a year, but it is necessary to repeat it each year as for figs." It must be borne in mind that these men lived in a seedling date region where there were

*History, Book I, ch. 193.

†Historia Plantarum, ed. Wimmer, vol. II, p. 6.

‡Historia Naturalis, Book XIII, ch. 7.

probably so many male palms that the fruit was pollinated even without the aid of man.

But if they did not grasp the prime importance of the operation, they had a good excuse in precedent, for one of the most humiliating episodes in the career of the "divinely inspired" and professedly infallible Muhammad was due to the same ignorance—and it occurred at Madína, which has always claimed to be the center of the science of date growing. One spring the prophet announced that the artificial impregnation of the palm was an unnatural practice, and in the future would be unlawful for his followers. They loyally abstained, with many misgivings, no doubt; and in the fall there was no date crop. An indignation meeting was immediately held and a citizens' committee called on the prophet for a heart-to-heart talk, as a result of which Muhammad made a statement to this effect: "You are weak in spiritual knowledge, but are worldly-wise; therefore in the future I will confine myself to the government of your spiritual welfare, and let you manage the affairs of this world to suit yourselves." Next year the palms were artificially pollinated and the crop good as usual.

Egypt has always been noted for the number of male palms it contained,* and it is probable that fecundation by the wind relieved the growers to some extent of the necessity for artificial impregnation; at any rate, the traveler John Ogilby, who wrote in

*A report is still extant, made to Umar b. al Khatib, the second caliph, when he was contemplating the conquest of Egypt; his informant describes it as "a soil rich in harvests and in male palms." Quoted by Masúdí in "The Prairies of Gold," vol. III, p. 125. Paris, 1864.

1670,* quotes one of his predecessors to the effect that the palms were sometimes pollinated by the wind. His description of the date is so quaint that it is worth a slight digression to insert it: he entitles it "The Dadel, a Tree Unknown to Us," and says:

"In several places about Egypt and especially about Alexandria are great woods of Dadel trees, which the Arabians from the name of the fruit called Dachel.†

"The Dadel tree, of which there are male and female, hath every other year abundance of fruit, but the female affords no fruit unless her branches be plashed with those of her mate. Many, to make the female fruitful, strow the matter that lies in the bag or receptacle, out of which the blossom and fruit comes, upon her branches; and probably if the Egyptians did not do so, they would bring forth no fruit, or if they did, they would never come to any perfection. But Veslingus seems to reject this, ascribing the great fruitfulness of it to the soil, being sandy and nitrous: for he affirms that he hath seen the earth in the Dadel-tree wood oftentimes thick-covered with a white down or callosity, like cellar walls where we find our saltpetre, which by the sultry south winds from negro-land and the barren Arabia, is in great abundance driven up hither, and falling on the tops of the Dadel trees, not only makes them flourish but also pregnant.

"The roots are so small, thin, and short that it is a wonder how it supports itself, being so great, especially when often charged by strong and assiduous

*Ogilby, John. *Africa*, p. 105. London, 1670.

†Properly Daqal or Degal. The word Daddel is the Swedish and Dutch for "date"; both go back to the Greek Daktylos.

gusts; for, contrary to other trees, this tapers downward and the slenderest part of the stalk is nearest the foot, which has made some suppose that the plant, though large, receives no nourishment from the earth by the root, but by the air.

“There is no tree more profitable, or turns to greater account than this.”

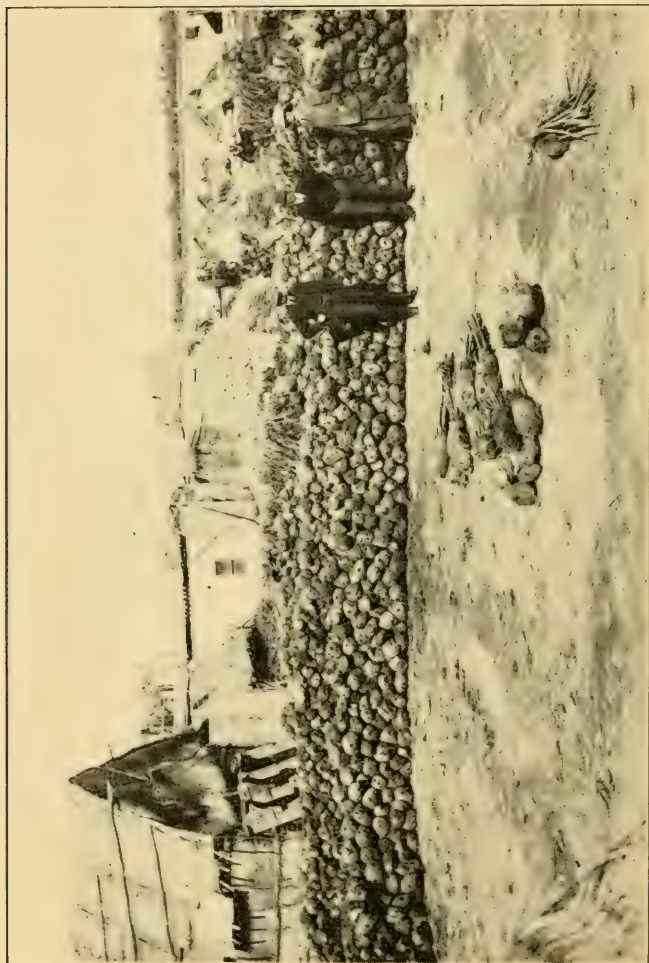
The natural pollination mentioned by Veslingus seems to have been exceptional, however, for in 1800, when the French invasion prevented work in the fields, the palms around Cairo were not pollinated, and the crop was a total failure.*

At the present time no dependence whatever is placed upon nature in the orient, and even the most isolated clumps of palms around water holes in the desert will, if they bear dates, be found to have been pollinated by some nomad Arab who looks on them as his property. A few cases have been noted in America where pollen has been carried, perhaps by insects, for distances of a quarter of a mile or more, but there is little data on which to form an opinion as to the possibilities of the fecundation of a female in a date growing country, without the aid of the grower, and the question is of no practical interest. An Italian poet of the fifteenth century† describes the pollination of a palm near Otranto by pollen carried by the wind from a male forty-five miles distant, but it is to be feared that his poetic temperament interfered with his truthfulness.

The method of pollination in America is the same as that practised in the orient, and it is given so clearly

elile, Egyptian Flora.

†Pontanus.



OFFSHOOTS READY FOR SHIPMENT

Part of West India Gardens' importation at Busreh, Turkish Arabia, in February, 1913, awaiting ocean steamer.

and accurately by a Persian writer,* that I quote his account verbatim: "*Phoenix dactylifera* being diœcious—that is, having the male and female flowers on separate trees—artificial fertilization becomes a necessity, and is the means of ensuring a crop, especially where the male trees are far from the females, or not in the way of wind or insects. The latter agents are not considered sufficient by the date cultivators of the Persian Gulf, as when artificial fertilization is not resorted to the fruit yielded is abortive or blighted, with little flesh, without stones, and totally insipid. Under these circumstances it is called *shis*.† Therefore human agency, or artificial fertilization, is considered essential to a good crop of first-class dates.

"This important operation is performed in the following manner: As soon as the spathe, or covering of the bunch of male flowers, has attained its full size and has come to maturity, it is detached. Its maturity is known by a faint rustling sound, elicited when the central part of the spathe is gently pressed between the fingers. Also if a slit is made in the margin of the spathe, so as to expose the flower, a peculiar odor is detected. When the bunch of mature male flowers is detached, the spathe is split open and the sprigs of male flowers are carefully removed and placed in a basket, which is then suspended and protected from

*A. R. Hakím Khán Bahadur, assistant to the political resident at Fars, in memorandum dated July 1, 1884; quoted by Bonavia, "The Date Palm in India," p. 47. Calcutta, 1885.

†The universal and classical Arabic word, although there are many synonyms. In Algeria it is called, by metathesis, *sish*. Such dates frequently cause a report of the existence of seedless dates. All supposedly seedless dates reported to me by Arabs, which I have personally run down, have turned out to be merely unpollinated, but genuine seedless dates undoubtedly exist. They are described by Palgrave and others.

draughts, so as to prevent the pollen from being scattered. The male flowers are allowed to remain so for twenty to twenty-four hours before being used.

“As soon as the female flowers have burst their enveloping spathe, the cultivator considers them fit for impregnation. He then takes with him a number of male sprigs, climbs up the female tree, and inserts one or two sprigs of male flowers into each bunch of female flowers, securing them with a strip of date leaflet. If the cultivator finds that some of the more forward female spathes have not yet burst, to save himself the trouble of reascending, he splits them open and inserts the male sprigs as before. Only very small and backward spathes he leaves for a subsequent operation, when he thinks them sufficiently matured.”

The operation always takes place in the middle of the day, since dampness is the greatest factor in failures. In Egypt, any time between ten a. m. and three p. m. is considered suitable. In Algeria, the cultivator does not work if a north or east wind is blowing, but does not object to a south or west wind, as these two are hot and dry.

It is preferable to shake the male sprig over the female flower, before tying it in place, as the pollen thus reaches all parts of the cluster to better advantage. If a sheet of paper is held under the cluster, the pollen which falls can be caught and saved for the next palm. A paper bag is the best thing in which to carry the male flowers. It is probable that future experimentation will suggest some improvement over the Arab's method of handling the pollen. A weak bellows, such as is used for insect powder, has been suggested.

As far as the pollen is concerned, the most

important thing is to keep it dry from the beginning. For this reason the male flowers should be cut only during the warmer part of the day, and dried very carefully, otherwise the minute grains of pollen will agglutinate into a mass of no potency. If pollination is performed in moist weather the same result may take place on the tree; and if a heavy fog or rain occurs after the female has been pollinated, it may wash off all the pollen. In such cases the blossoms should at once be repollinated, and usually the crop can be saved.

If the pollen is kept dry it preserves its value for a long time, and in some date growing communities it is the custom to save a small supply from each year to the next—a custom that may well be followed in America, where females sometimes show surprising precocity in bloom. A pollination made in 1912 at the Mecca Experiment Station with pollen seven years old, sent from the Tempe garden, was entirely successful. The elder Michaux reports,* but apparently not of his own knowledge, that pollen had preserved its power during nineteen years, in Persia. It can also be shipped easily from one region to another. Busreh often supplies pollen to a large part of the Persian gulf.

In case of a shortage of pollen, that of almost any other species of *Phoenix*, or even distantly related genera, will give results. *Phoenix canariensis*, which abounds in the southwestern United States, furnishes an excellent pollen for fertilizing the date palm, and with some varieties, such as Ghars, the fruit produced is even better than when pollination is from a male of

*Annales du Museum, Paris. Quoted in "Vegetable Substances Used for the Food of Man," vol. II, p. 46. London, 1846.

P. dactylifera. In California, Drummond has successfully pollinated the date palm with the California fan palm, *Washingtonia filifera*, and the Mediterranean dwarf palm, *Chamerops humilis*,* both of which are common. There is certainly a field for fascinating and valuable experiment here.

The palm usually flowers in March or April, but it is not regular, and blossoms may be found from February to June. It is, therefore, necessary to have enough varieties of males to provide pollen at various periods, unless one has males that bloom unusually early, and preserves the pollen from these.

In order to be safe, a grower should have three or four males for each one hundred females. Nevertheless, a really good male will pollinate a much larger number of palms than is indicated in those figures—frequently several hundred. Arabs point out males which they say will pollinate one thousand palms; and there is one at Indio, California, which might almost match this record. There is just as much difference in the value of males as there is of females, and if one secures a really desirable specimen he should use every exertion to propagate it as rapidly as possible.

Schweinfurth, in 1901, declared that the characteristics of the male had an influence on the fruit which resulted.† His statement was promptly challenged, as the generally accepted idea was that the influence of the male would not be seen in the

*M. Denis of Hyères did this a quarter of a century ago, and Naudin named the hybrid *Microphoenix decipiens*. F. Sahut of Montpellier crossed the date palm with *Trachycarpus* (*Chamerops*) *excelsus*, in 1884, and Carriere named this hybrid *M. sahuti*. Ed. Andre in *Revue Horticole*, p. 128. Paris, 1893.

†Schweinfurth, Dr. George. Ueber die Kultur der Dattelpalme in *Gartenflora*, vol. 50, p. 513. Berlin, 1901.

immediate resulting seed, but only when that seed was planted and in turn produced fruit. But the important experiments of Bruce Drummond, assistant arboriculturist of the Bureau of Plant Industry, in California, during recent years seem to confirm Schweinfurth's statement, and to show that the qualities of the male which is used for pollination have a decided influence on the fruit which results. Not only does the variety Ghars seem to produce better fruit when pollinated with *Phoenix canariensis* than when *P. dactylifera* is the parent, but a variety of males has been tried on different palms, and markedly different results observed. A difference of as much as one-third in the size, and of twenty days in the time of ripening, seems to have been due to a change in the male used for pollinating. In most Arab communities this fact seems to have been overlooked, and the value of a male is judged solely by the amount of pollen it produces; but the more intelligent growers of Baghdád and Oman confirm Schweinfurth and Drummond, declaring that the male used has a direct influence on the quality and quantity of fruit produced.

While more evidence is needed to establish the proposition beyond dispute, it is of such importance that no one can afford to select his males haphazard. Unfortunately, the only way to know the quality of a male is to find out by experiment, and this requires some time; but it will be advisable to secure offshoots of males of known performance, and to depend on chance seedling males as little as possible.

The flowers of the female palm usually open before the spathe does, so that pollination can be successfully performed even when the spathe is prematurely opened by a knife in the hands of the planter.

Experience has shown that this is not always the case, however, and a number of failures, where no fruit has been set, have been traced to the fact that the individual blossoms of the female remained tightly closed for several days after the spathe had opened, thus giving the pollen no chance to enter when it was shaken over the cluster. If any palm shows a disposition to set no fruit—and usually a palm with this tendency shows it each year—the operator should examine the female flowers under a low power microscope, to see whether they are opened or closed. If opened, a minute sticky substance, looking like a drop of dew, will be seen waiting to receive and fix the pollen: until this is apparent, it is a waste of time to pollinate the cluster.

The difference between male and female flowers is marked, and when once it has been pointed out, no one can ever confuse them; but as it is of vital importance to every grower, and offers the only certain means of distinguishing the two sexes, I quote Milne's careful statement* at length:

“In spring a number of structures, at first greenish and later brown, and measuring four to six inches across and a foot or more in length, make their appearance at the bases of the leaves which crown the palm. These structures are called spathes and each spathe incloses a cluster of flowers. When the spathe has become brown in color and has attained something like the size mentioned above, it splits open and exposes the cluster of flowers which it contains. Each flower consists of a central stem with a hundred or more branches radiating from it near its end and somewhat after the fashion of the hairs of a

*Milne, D. “Date Cultivation in the Panjab,” p. 12. Lahore, 1911.

paint brush. Each of these small branches carries on it a larger number of tiny flowers.

“The small branches on the male flower cluster are about six inches long, and if the cluster is shaken about the time the spathe splits open, a dense cloud of yellowish pollen dust will fall from it. On examination it will be seen that in every little flower there are six little, yellowish pollen sacs, each on the top of a tiny stalk, and that it was the contents of these little pollen sacs that formed the cloud of pollen dust. Around the six little stalks with their pollen sacs (stamens) are six colorless little scale-like structures which represent the sepals and petals in familiar flowers. These scale-like sepals and petals close over and protect the stamens until the pollen sacs have matured their pollen grains and are ready to burst and set the pollen free. Very soon after the large brown spathe splits open, the scales (sepals and petals) which covered and protected the stamens open out and the pollen sacs burst. The opening of the scales and the bursting of the pollen sacs are due to the cells of their epidermal tissues drying and contracting under the heat of the sun. The pollen sacs are usually open within an hour or two after the bursting of the spathe.

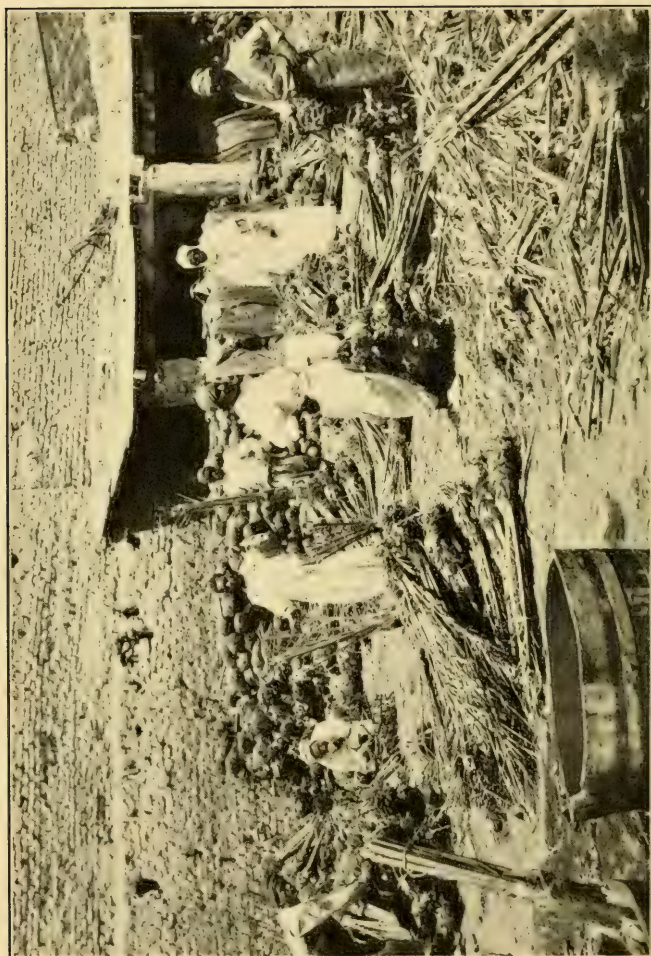
“The spathe which encloses the female flower cluster is very similar to that which encloses the male cluster* and it bursts in the same way when the female cluster is ready for fertilization. The small branches of it are, however, less confined to the end of its main axis and are very much longer than the small

*Furthermore, the shapes of both vary according to the pressure and distortion to which they have been subjected while emerging from the palm. Therefore attempts to identify the sex of a palm by the shape of an old spathe remaining on it are uncertain.

branches on the male flower cluster. The female flower also differs very much from the male flower. It is an oval-looking body and might be mistaken for a male flower in which the white scales (sepals and petals) had not opened out. On dissecting it, however, it will be found that the central and main part of the flower is formed of three solid bodies closely applied to each other on their adjacent faces and forming what appears like one oval body. Each of these three solid bodies is called a carpel and contains a structure called an ovule, which when fertilized by the pollen gives rise to a seed, the carpel giving rise to a fruit at the same time.* At the bases of the three carpels are six scale-like structures similar to the protecting scaly sepals and petals found in the male flower, but very much smaller and clinging more closely to the carpels. A mass of female flowers therefore never has the very waxy, white appearance which a mass of open male flowers has.

“At a distance, therefore, the flower clusters may be distinguished by the fact that the small branches in the male cluster are about six inches long and densely clustered at the end of the axis, while those of the female are usually several times that length and less densely clustered at the end of the axis. When the flowers newly open they may also be distinguished at a distance by the white waxy color of the male flowers, and the more yellowish hue and less crowded appearance of the female flowers. If taken in hand at this stage a dense cloud of pollen dust will be produced from the male flower, while none will appear from the female flower. Also six stamens with


*Two of these carpels drop off while the dates are still small, leaving only one fruit on each stem, under normal conditions.



BUYING OFFSHOOTS IN THE SAHARA

They are collected in small lots from native owners and transported on camel back, sometimes two hundred miles, to the railway, where they are packed.

six comparatively large, waxy-looking scales will constitute each male flower, while the female flower will be composed of three carpels closely applied to each other and forming what looks like a single solid, oval body, and having six very tiny scales closely applied to the base. The flower clusters can also be distinguished at that stage by their smell."

 It must be noted, however, that in all parts of the world monœcious date palms are occasionally found—that is, palms on which one cluster will be composed of male flowers and another of female flowers. In such a case the female cluster will produce fruit if pollinated by its brother, the male spadix. Again, hermaphrodite flowers are sometimes found, where several more or less functional carpels and several more or less functional stamens occur in the same flower; this can only be classed as an abnormality. It appears that the same tree may be normal one year and monœcious the next, or may suddenly throw out a few hermaphrodite flowers and never do so again, but resume its normal functioning. Such cases are of great interest to botanists, and anyone who may observe palms of this kind should report on them. For the commercial grower, they have no practical importance.

It is also worthy of note, in passing, that a date palm sometimes flowers in the fall instead of the spring. This has been the case on the coast of Southern California, where the summers are cool; the palm then carries its fruits half-matured through the winter, and ripens them the following spring. It is also doubtless the case with the varieties of dates reported in Egypt, which bear two crops a year—the second crop must be due to a fall flowering, the fruit of which

is carried through the winter. In an ordinary date country the grower is not likely ever to see such a case, but if he did, the value of it would be lost to him unless he had some pollen stored up in reserve.

Artificial pollination is the only delicate operation connected with the culture of the palm, and the inexperienced grower usually is frightened by it; yet it is troublesome not because of any intrinsic difficulty, but merely because it is a kind of work which the average rancher is not accustomed to perform. Any man of average intelligence can do it, and once he has done it he will have no hesitation about attempting it a second time. But as the success of the crop absolutely depends on it, and as the beginner is naturally worried by this fact, I will go over the necessary operations again.

When a female spathe begins to crack, a male spathe in the proper stage of development must at once be selected. It is better not to wait until the male spathe has split open, as a good deal of the pollen will then be lost; its brown color and soft texture usually indicate when it is about ready to open. The spathe is then cut off and the cluster taken from it. It will be seen that the pollen sacs have not yet burst, but are still covered by their waxy white scales. The small sprigs of the flower should be cut apart and spread out in a dry place, free from air currents, until they burst and have had a chance to dry; if put in the sun this will take only a few hours in an atmosphere such as that of Coachella Valley. They should then be placed in a paper bag for convenience in carrying; if the pollen falls out of its sacs it will be held in the bag, and can still be used. The spathe of the female flower, which has already split, is pulled apart to

facilitate work, and a sprig of the male shaken over it, then stuck in it and tied in place by a piece of string, so that if some of the female flowers have not yet opened they may still be pollinated by the wind. That is all there is to it.

The work at this season of the year requires constant and conscientious supervision, however, for if the female clusters are not pollinated very soon after the spathe bursts, they usually become unreceptive. An inspection of the plantation every other day during the flowering season would probably suffice, but if a grower has only a few trees he can easily keep track of them every day. When he has pollinated a cluster, it would be convenient to tie a bright colored piece of cloth to it, so that he would not be confused as to which clusters he had pollinated and which he had not.

MALE PALMS

CHAPTER VIII

MALE PALMS

If it is accepted that the characteristics of the male exert a direct influence on the fruit produced, it becomes of prime necessity to select the male parent with as much care as the female. This is a field in which most of the experimentation remains to be done, and each grower will have to work the problem out for himself, trying the pollen of different males on the same palm, preferably by pollinating each cluster on the female from a different male. If the clusters are then tagged to show what pollen was used, a good idea can be had in one year as to the most desirable mate for that particular variety, and the grower can then propagate enough of that strain of males to ensure as much pollen as he needs. With a plantation of average size, and a good supply of males with which to experiment, only a year or two will be needed to find the right combinations in each case and the grower can then go ahead with confidence. If he does not possess enough males, there is danger that he may continue for some years without getting the best or earliest crop possible.

It is therefore desirable that he should keep as many of his seedling males as will not interfere with his other work, and this can best be done, as already explained, by planting a windbreak or hedge of seedlings and letting all the males remain in it.

But the tests in California, although not yet extensive enough to be conclusive, indicate that the merits of seedling males are, in general, not great,

and the scientific grower will do his best to get a collection of males of known varieties, even if he has only one of each kind. There are some males in the United States which fulfil all the requirements, and others have been imported from the orient.

Of the latter class, the best in Southern California has been found to be Ghanamí or "bushy head", which was brought from Busreh, where it is the favorite of the most intelligent growers. It begins to furnish pollen in its third year, blooms early in the season, and is prolific, often carrying from twenty to thirty clusters. In Arizona it seems not to have been quite so valuable as in California.

Other named varieties at Busreh are Hukrí, whose name probably signifies "what is laid by in times of scarcity" and points to the storing of pollen from year to year—although this practice is rare among modern Mesopotamians; Wárdí, "long haired", and Sumaysmí. None of these, I believe, has been introduced to the United States.

At Baghdád the number of named varieties of male is larger, fifteen or twenty being distinguished, but all by the name of the female variety of which they are supposed to be a product. One speaks of an Asharasí male, and means that originally it was a seedling of the Asharasí female—but no one knows what its male parentage was. Nowadays, of course, the variety is propagated only by offshoots. Asharasí is declared to be the best of all males there, Arabs declaring that it sometimes bears forty or fifty spadices, and that not only is the yield of fruit larger when this variety is used for pollination on any female, but that the flavor of the dates is also better. Accordingly, the best kept gardens contain only this variety of male;



NOMADS ENCAMPED BY A CLUMP OF PALMS

View taken in the Sahara desert, showing how a palm will look if its offshoots are allowed to grow to full size, without being detached.

but if it is lacking, Bárbán is preferred, with Khadhráwí third choice. The Baghdád males have not yet been tested in the United States. I imported forty-nine offshoots of Asharasí in 1913, but in order to avoid confusion with the female of the same name I kept only the first two syllables, and added an Arabic word for male; so the variety is introduced to California as Ashar Fahal.

Many offshoot-propagated varieties of males from North Africa have been tested in the United States, but with poor results, a large proportion of them proving sterile—a condition often found in seedling males, as well. None of them was named—in fact, Busreh and Baghdád are the only regions where I have been able to find named varieties of male perpetuated, unless it be in Oman, where I could get no conclusive evidence. In Algeria I heard of, but did not see, a male variety called Fahal Aksba.

A male imported from Egypt some years ago under the name of Dakar Majahel* has proved better than any other in Arizona, but has been of little value in California.

As a start, the best thing a grower of dates can do is to consult his neighbors and find out what males succeed in that locality, then secure these and use them until he is able to test the needs of his palms for himself. He should act early in this matter, for more than one crop of fruit has been lost in the United States through lack of pollination, in spite of the large number of seedling palms which are to be found everywhere.

Then, if the grower has planted a hedge of palms,

*But this is not a variety name. It is simply some one's attempt to spell the Arabic for "unknown male."

as has been often suggested here, he will have a large number of males, representing all kinds of characteristics, and taking up so little room on his grounds that they can be allowed to grow indefinitely. With the pollen of these he can begin to experiment, both on other seedlings, and (in a more limited way, not to reduce profits) on his choice varieties of palms, until he has found what each male will do. As soon as he gets a male that satisfies any particular variety of female, he should make a careful note of the fact and use nothing else with that variety. If he has such a male as Ghanamí to start with, it is quite likely that he will find nothing better; but whatever male he selects for perpetuation he can readily propagate by offshoots until he has as many as he can ever need, and some to sell to his neighbors.

If one secures a male that blooms very early and seems potent, he should propagate it as a precaution, so that he may always have pollen at the beginning of the season.

Until seedlings have blossomed, no way has yet been found to distinguish male from female. Doubtless there are some differences, but they are not sufficiently marked and constant to be relied on. But as soon as the first flower has appeared, the question is permanently settled.

The offshoots of different male varieties differ from each other almost as much as the offshoots of different female varieties; but in general it is not difficult to distinguish a male offshoot from a female offshoot, and an adult male palm can be told from an adult female in most cases, although not in all, for some varieties of female exactly resemble a male palm. The general difference is that the male has more and

heavier leaves, which are stiff, and closely packed together; the trunk is usually stouter.

The characteristics of a male offshoot, as distinguished from a female, are generally as follows:

The number of the leaves in the crown is greater.

The segments of the leaves are somewhat stouter, and their sharp points are consequently more penetrating.

The spines are frequently heavier and set closer together.

The leaves have a crowded appearance (because there are more of them).

If there is a stem, it is usually thicker than in the case of females.

It is not to be supposed, however, that a novice can decide with certainty whether an offshoot is male or female. Experience and close observation are required.

Arabs of Northern Africa have an interesting theory that if the midrib of each leaf of a male palm, still young, is split from tip to base, the palm will become a female. This has not usually been considered worthy of the attention of scientific men, yet a French grower at Biskra claims to have proved its truth to his own satisfaction. Anyone with a few male seedlings to spare may be interested to try it for himself. The Frenchman referred to also states that he has succeeded in grafting the palm—an operation that is, theoretically, not impossible, but at least has never been accomplished (unless by him) and placed on scientific record.

As particularly choice varieties of males are found and perpetuated, it is much to be desired that

they be given distinctive names. This, however, should be done by some association or scientific body, as experience has amply proved that where the nomenclature of varieties is left to individual growers endless confusion inevitably results. Perhaps a co-operative association of date growers could appoint a committee to supervise such matters.

HANDLING THE CROP

CHAPTER IX

HANDLING THE CROP

A few dates—Persian Gulf varieties—ripen during the last week of July in California, under favorable conditions, but August is as early as one can expect any of the sorts which have so far been tried out here, and a much larger number still will come on in September, which is the month of principal harvest, unless the summer has been abnormal. In October the late dates, and particularly those from Algeria, mature, finishing in November, the first half of which should see the wind-up of the entire harvest, unless it be for some particular variety like Shitwí or—in Arizona—Badrashín.

This crop season corresponds with the season in all other date growing countries, except India, where the advent of the monsoon in summer forces the dates in many districts to complete their maturity before July. At Baghdád the first dates ripen in August and the last in November. At Busreh the same is the case; the height of the season is mid-September, when Haláwí, Khadhráwí and Sáyr, the three great commercial varieties, are simultaneously on the market. Oman has the earliest dates I know; they are to be found in the market from May 15th to November 15th, in a fresh state. Some of the Egyptian dates are said to ripen in June, but the bulk of the crop does not appear before August 1st. In Arabia proper—at Madína, for example—the first dates appear June 1st, and the main harvest a month later. In

North Africa September and October are the months of greatest activity.

As the fruit begins to soften, it is the object of a good deal of anxiety on the part of its owner, for it may meet injury in several ways, against which he must guard. An unseasonable rain may cause nearly ripe dates to ferment. This is little to be expected in Southern California, and experience has shown that in that dry climate the effects of an untimely shower are so soon obliterated by the sun that the actual damage is slight. In Arizona there is greater danger, for the ground and air may remain moist for days after the rain has stopped. In such a case, if the dates are ripe enough to receive damage, they must be at once picked and prepared for market by the rapid artificial method described in another chapter.

Insects and birds sometimes make trouble when the fruit is ripening.* A bag of cheesecloth is absolute protection against them, however. In some localities human thieves are still more annoying. The Arab of North Africa is a redoubtable visitor at night: no wall or hedge will turn him, nor does the fiercest dog deter him, for he strips off his clothes and smears his body with a rancid grease. Then if a dog appears, the native drops on all fours, and the most vicious animal will not attack such an extraordinary creature.

When the dates are finally ripe enough to pick, the greatest activity of the year begins. If one is so fortunate as to have varieties which mature their fruit evenly and bear it on long stems, he will save a lot of money, for it can then be stripped off the tree without delay. In Arizona, Birket al Hajji has proved the

*Arabs speak of particularly choice dates as "crow's dates" because the crow is thought to select the best fruit on the palm for his attacks.



EIGHT-YEAR-OLD DEGLET NUR

Carrying offshoots as well as a large crop of fruit, at Indio, California. Has never shown a tendency to bear intermittently.

best of all varieties to pick—two men can easily gather one thousand pounds in a day. Ghars, on the other hand, holds its fruit close between its thorny leaf stalks, and as, in the moist climate of Tempe, it ripens unevenly, the picker must scrutinize each individual berry. Under these circumstances it has been found at Tempe that a picker sometimes will not secure more than fifty pounds of Ghars berries in a day.

Two men can usually work together to advantage, one holding a basket into which the other places the berries. They should cut the spines from the leaf stems before beginning work.

At the first picking it is best, unless with a variety which ripens its fruit very evenly, to go over the bunch carefully, and select only those dates which are really ripe enough to pick. The rest of the bunch is left on the tree for subsequent picking. In bad climates, or with bad varieties, the dates may have to be taken at three or more times, but in Southern California this is rarely the case. The Arab usually cuts a whole cluster at a time, but he wastes a great deal of the crop, and has more culls on his hands than a scientific grower will desire. His methods are not to be taken as a pattern. He frequently cuts a bunch and lets it drop twenty or thirty feet to the ground to save the trouble of lowering it on a rope.

If the dates are to be consumed at home they require no further treatment, unless it be a washing to clean them of dust. The dainty Arab grower sometimes rinses them in diluted date syrup—a refinement that is hardly worth while. If they are washed, they should be well dried in the sun.

If they are to be kept for some time, or are to be marketed, they should be pasteurized as soon as

they are brought from the field, in order to free them of insect eggs and the bacteria of fermentation and decay. A temperature of 180° to 190° F. for three hours is all that is necessary. The rancher can perform the operation in the oven of his cookstove, in a rough way, but commercial growers will probably build an oven for the purpose, in order to handle considerable quantities of fruit, spread out on shallow trays with wire-mesh bottoms, to give free circulation of the air. If an incubator is kept for rapid artificial ripening of the dates, it can also be used for pasteurization.

In a dry, hot climate, and with suitable varieties of dates, pasteurization will be unnecessary unless the fruit is likely to be stored for a long period of time. The grower should use his own judgment, but he should err on the safe side, for it will be detrimental to the entire future of the industry if any one puts on the market dates which are infested with worms.

If the dates are ripened on the palm, they will be ready for packing as soon as they are pasteurized and after, in the case of soft varieties, they have been dried well in the sun. Otherwise they must be artificially ripened, but I leave the discussion of that process for a separate chapter.

Packing is a subject on which the grower must follow his own ideas, or, later, the ideas of the co-operative association of which he may be a member. I can, therefore, only give some general suggestions. It is hardly necessary to point out that packing is, as far as the creation of public sentiment is concerned, probably the most important part of the date industry, and that any grower who allows himself to sell dates that are not well packed is injuring not only his own

interests, but those of every other grower in the country. Eventually, no doubt, it will be necessary to have a strong co-operative association to standardize the packs and see that every brand is kept at par.

If dates are to be packed in bulk, the box should be lined with a good grade of heavy, paraffined paper, and the fruit laid in rows, sufficiently pressed together to be tight, and prevent the dates to some extent from drying out, but yet not enough to squeeze them out of shape. It is desirable that dates should be packed with the calyx in place, as when this is pulled out it leaves a broad avenue for dirt and worms to enter the seed cavity. One can not absolutely insist on this, as it is impossible with certain varieties.

The pack must be uniform, every date being of the same variety. Otherwise the grower can not expect to get any higher price than is paid for culls.

If the dates are not to be sold in bulk, and yet can not meet the requirements of the fancy trade, a wooden berry box offers a cheap and convenient means of packing. If soft, the dates should be covered with paper, and a ribbon across the top adds a touch of attractiveness at a slight cost. But in such a matter each packer will have ideas of his own.

The most remunerative trade, however, and the one to which every shipper will desire to cater if the quality of his fruit permits, is that for dates packed like confectionery. For this purpose, boxes holding a pound or two pounds are used, and may be made of pasteboard, wood or tin; the former are good enough for ordinary purposes. Usually only two layers of dates are placed in a box, but they must be selected fruit, every berry plump, sound, well ripened, and not crushed. The top layer is packed with a little extra

care, and a narrow space left down the middle of the box, lengthwise, in which a piece of one of the slender branches of the date cluster is placed, so that the effect, on opening the box, is that of dates still attached to the branch. A minute's inspection of any well-packed Algerian or American dates will show the method of packing, and the packer's success with it depends solely on his own neatness and good taste and the quality of his materials. The oiled paper should be folded over the top of the dates, before the cover is put on. If one wishes to sell dates at \$1.00 a pound, there must be nothing about the package that is not first-class, and the grower has plenty of room to show his artistic skill in providing a suitable label.

There remains the marketing of dates in bunches, a feature of the industry that, I believe, will have an important future for those date-growing regions which are conveniently near to a market, and in the case of suitable varieties, such as Záhídí in the stage which Baghdádís call "kúrsí." Deglet Núr and Yatímeh also hang well on the cluster, and are much sold in that condition in the Algerian markets; so do many other varieties, if they are properly handled. For this purpose as large a cluster as possible should be selected, and all spoiled or immature dates picked off. If it is placed in the grocer's window, properly protected from flies, and if the dates are really good, few customers can resist purchasing. A large bow of ribbon on the stem of the cluster would add to the attractiveness of the display.

By the use of artificial ripening, it is possible that clusters of dates which mature evenly could be shipped while still firm, even to a distant market, and ripened on their arrival, before being exposed for sale.

ARTIFICIAL RIPENING

CHAPTER X

ARTIFICIAL RIPENING

From the dawn of history crude methods of artificial ripening have been practised on the date. The Arab sometimes takes a bundle of nettles or thorny twigs and beats a green cluster of dates with it; the perforation of the skin sets up a fermentation in each berry which, to an Arab palate, quickly makes it ripe enough to eat. Again, he cuts partly through the stem of the cluster, and by thus shutting off some of the nutrition supplied to the dates causes them to ripen prematurely.

The process is oftener applied after the dates have been picked. Indeed, the immense quantities of boiled dates sold in the Persian Gulf region and India are really only dates that have been ripened artificially. They are taken while still hard and nearly green, and boiled for an hour or more. If astringent, a large handful of salt is added to each gallon of water. Then they are dried for eight or ten days in the sun, and are ready for use. In some regions, after boiling they are fried in oil. This renders them hard, and usually there is some astringency left, but in the most satisfactory cases the flavor is nutty and crisp, or sometimes very much like maple sugar. Dates in this condition will keep for a year or more.*

In the Sindh desert green dates are "ripened" by a quick process, being packed tightly in jars of

*Dates so prepared are called *kharak pokhta* (Pers.) or *khalal matbúkh* (Arab.), both of which mean "boiled, unripe dates"; or in India, *bhugrian* or *chuhara*.

salt and left overnight. A similar method is in use in Egypt.

Most of the dates of Spain are also artificially ripened, by immersion in hot vinegar for a few minutes. The acetic acid ripens them over night into an eatable product.

A peculiar slow method of ripening the variety Yatímeh is used in Algeria, an entire cluster being cut before it is quite ripe, and packed in a box entirely surrounded by dry dates, usually of the variety Máshí Degla. They are left until spring, when the dates come out in perfect condition.

Most Deglet Núrs of North Africa undergo slow artificial ripening, usually without realization on the part of the packer of what he is doing. They are picked when they show a translucent spot on one side, and are then packed; after eight or ten days they are in perfect condition for use.

The big Majhúl dates of Tafilalet are all ripened off the tree, being picked when they have turned yellow, and spread on the ground in the sun. They are not protected at night, but the dates of Lower California and Mexico, which are artificially ripened in the same manner, are wrapped up in blankets at night to keep the temperature more even. The same process, in principle, is used all over the date-growing world, and at harvest-time the flat roofs of the houses are always covered with curing dates.

Even before the Christian era, Pliny points to artificial ripening of dates in Egypt, when he says,* "The date of Thebais is at once packed in casks, with all its natural heat and freshness; for without this precaution it quickly becomes vapid; it is of a poor,

*Hist. Nat., Bk. XIII, ch. 9.



FLOWERS OF THE PALM

Left, the crowded blossoms of the male; right, the more widely separated blossoms of the female.

sickly taste, too, if it is not exposed, before it is eaten, to the heat of an oven."

There is nothing new, then, about the idea of ripening dates artificially, but the attention of science was never turned to the subject until it was taken up by Americans. Members of the University of Arizona Experiment Station began the work, and were afterward joined by investigators from the Bureau of Plant Industry, and private individuals. The investigations have been carried out along a number of lines, and while it is probable that none of them have reached their full development, they have been so definitely successful that artificial ripening can be considered a necessary part of modern date growing, and an operation which is within the means and skill of any intelligent rancher.

Advantages to be derived from artificial ripening of the date are thus summarized by R. H. Forbes, director of the Arizona Experiment Station:

1. The fruit can be harvested cheaply, by the bunch, before the berries begin to drop or are attacked by insects, mould, or bacteria.

2. Danger of loss by untimely rains is minimized.

3. The ravages of worms in the ripened crop are avoided.

4. Greater cleanliness of the product is possible than with naturally ripened dates.

5. Late varieties, among them Deglet Núr, which do not ripen satisfactorily here (in Arizona), may be successfully brought through.

6. Early varieties may probably be grown and ripened at higher altitudes than formerly.

7. Dates while yet hard may be shipped without

injury to a distance, then ripened artificially, and marketed in a fresh and prime condition.

Work in Arizona was first begun with the use of moist heat, and this was carried on until successful results were obtained, with the drawback that much of the cane sugar was turned into invert sugar.* Dr. A. E. Vinson then took up the use of chemicals, and found many which would induce artificial ripening. Some of them, however, had the disadvantage of making the dates inedible, because of their own odors,—e.g., gasoline and ammonia. Among the substances which gave fairly good results were benzoic acid, salicylic acid, sodium benzoate, sodium salicylate, sodium acetate, potassium acetate, oxalic, malonic, succinic and lactic acids, acetamide, formamide, hippuric acid, cinnamic acid, and hydroxylamine chlorhydrate. He finally settled on nitrous ether as the most desirable agent, but has since given this up in favor of carbon dioxid, which is now used to ripen most of the dates sold from Tempe Experiment Station.†

The basis of this application is the fact that the date, when it is ripening naturally, liberates large quantities of carbon dioxid. It was, therefore, assumed that this gas played an important part in ripening the dates, and experiment has shown this to be the fact.

*But this is hardly a real disadvantage, for most good (and bad) dates are invert sugar dates. Up to the present only two varieties have been found which are cane sugar fruits: Deglet Núr and Makantishí, of North Africa, and even these always contain at least a small percentage of invert sugar, just as all ripe invert sugar dates contain a little cane sugar.

†Vinson, A. E. "Chemistry and Ripening of the Date." Univ. of Ariz. Agric. Exp. Sta. Bul. No. 66, Tucson, May 1, 1911. The results of the work with carbon dioxid have not yet appeared in print, however.

The process of ripening dates in this manner is simple and not expensive. It requires only a tank of carbon dioxid, which can be obtained from commercial manufacturers, and a chamber in which the heat can be kept steadily at a temperature around 135° F. A tight closet or cabinet can easily be constructed for this purpose, with a hot water heater, to supply the essential humidity. The quantity of gas used is very small. Time needed will depend on the stage of maturity of the date when picked, but should never exceed twenty-four hours. Pasteurization should precede the treatment.

Dr. Vinson considers that this is the best method for large, soft dates, while moist heat gives better results with Deglet Núr. It must be stated, however, that the problems of Arizona, due to climatic conditions, are peculiar, and that what may be necessary or desirable there may be otherwise in a different state. In California less favorable results have been secured with the gas, and in the present state of affairs it is hardly worth while for a grower to try it, since entirely satisfactory results can be attained without it. In Arizona the grower must decide for himself what treatment he will use; if he is in such an unfavorable situation as Tempe, where the ground is continually saturated, the air frequently moist, and summer rains to be expected, perhaps carbon dioxid will be necessary.

Moist heat was used by G. F. Freeman of the Arizona Experiment Station, who first published details of the work;* afterward it was taken up by Bruce Drummond of the Bureau of Plant Industry Station at Indio, California, and a number of private

*Freeman, G. F. "Ripening Dates by Incubation." *Ibid.*

growers under his supervision. The method was brought to efficiency,* but has been partly abandoned in favor of slower ripening without artificial heat. It is still invaluable, however, in the case of dates which have been exposed to rain while ripening, or have mummified on the tree, or when for any other reason it is desired to produce quick results; and every grower can and should master the details of it. It is true that a good deal of the technique depends on the judgment of the operator, but this is also the case with the baking of bread, in which every good housekeeper has attained success.

The apparatus required is an oven of some kind in which heat can be maintained at about 110° F. for a period of twenty-four hours. A large incubator made for poultrymen will do, but something cheaper could easily be constructed from galvanized iron, provided with a coil of hot water pipes and a kerosene lamp. The dates should be washed and drained thoroughly, if they are nearly ripe; but if they are still hard, as is usually the case, they should be soaked in tepid water for from twenty-four to forty-eight hours. Then they are placed on a screen in the incubator, with a pan of water underneath, and the incubator tightly closed. If the dates were picked when hard, from eighteen to twenty-three hours will be necessary, at a temperature of 110° F., to ripen them, but if they were soft, and merely picked because suddenly struck by a rain, a few hours may be sufficient to complete the process, which has the advantage of freeing them from all insect life, as well as preventing fermentation.

Good dates are undeniably produced by this

*Results of this work were never published authoritatively.

process, yet the flavor, because of the effect of heat on their syrup, is not quite like that of a naturally-ripened date. Hence the slower ripening without heat is more satisfactory, as well as cheaper and simpler, when it can be practiced, as it can in all ordinary cases in a favorable climate, such as that of California and most date-growing regions. It has given particularly good results with Deglet Núr, but seems to be applicable to practically all varieties. It is, indeed, used by Arabs to a certain extent for all varieties, and has been for centuries, as it has been for other fruits in all parts of the world. Swingle describes the process,* as it takes place naturally, as follows:

“My attention was drawn to the method in this manner: Toward the end of November, 1910, in coming from Mecca, California, to Washington, (D.C.), I carried in my valise a Deglet Núr cluster loaded with dates not ripe, but in the condition most favorable to incubation. I was ten days on the road, from November 23 to December 4, and during that time my valise was either in a sleeping car or hotel, both heated by steam to an average temperature of from 68° to 86° F. On my arrival at Washington I was astonished to find in my valise, not yellowish, bitter, and uneatable fruit but, on the contrary, amber, translucent dates with an exquisite taste and perfume, much superior to those ripened by incubation. They had even that characteristic Deglet Núr flavor so much appreciated by lovers of that variety.

“The idea came to me that this slow ripening which had taken place in my valise must also take

*Swingle, Walter T., *Maturation Artificielle de la Datte Deglet-Nour*. *Comptes Rendus de l'Academie des Sciences de Paris*, t. 155, p. 549, seance du 16 septembre, 1912.

place to a certain extent in the boxes of dates which are sent from the Algerian or Tunisian Sahara to Biskra or Marseille for packing and export. These boxes are oblong (16x32x64 cm.) and contain both loose dates and dates on the branch. They are carried on camel-back for two to five days, according to the distance of the oasis from the railway. Unquestionably the temperature in these boxes is high enough to permit the slow ripening of the fruit.

"In December, 1911, I accompanied my friend and colleague Dr. Trabut in the oases around Biskra to study the date palms and their diseases. Pierre Osval, manager of the oases El Amri and Foughala, west of Biskra, showed us some boxes of Deglet Núrs. These dates had been put in the box when they showed more or less translucent spots on one side; they were mostly detached, but there were also some in clusters. After eight or ten days in the storehouse, the fruit had become ripe and left nothing to be desired, either for color or for flavor.

"What Mr. Osval did deliberately takes place in most of the shipments of dates from the Sahara, without anyone paying attention to it. The dates must be picked before they are entirely ripe, to have them reach their destination in good condition; they then ripen in transit.*

"The ripening of dates," Mr. Swingle continues, "must be considered composed of two distinct phases. The first, which one might call 'botanical maturation,' is accomplished as soon as the fruit reaches full size and has the seed ripe. Dates at this stage are fat and smooth, yellow or red according to variety. They are very astringent and not eatable.

*Algerian Arabs regularly ripen Kasbeh (El Kseba) in this way.

“The second phase is the real ripening; it consists of complex chemical transformations. The cane sugar becomes invert sugar and the free tannin is deposited in insoluble form in the giant cells which Tichomirow, Kearney and Lloyd have described.

“Botanical maturation is simply accomplished with the aid of a sufficient amount of heat, an amount so large for late varieties that it is reached only in regions having an extreme desert climate.

“On the contrary, in the real ripening humidity plays an essential part. One cannot ripen dates artificially either by incubation or by the slow system, if the atmosphere is dry. In artificial ripening, the air which surrounds the dates must be saturated with the humidity which the dates give off as they dry and wrinkle. The packing cases in which Deglet Núr dates are sent from the oases to Biskra, Algiers or Marseille contain a mixture of loose dates and dates on the branch, so that the space between these branches is occupied by moist air. Deglet Núr can ripen on the tree in many oases of the Algerian and Tunisian Sahara; but in the extreme autumnal aridity of the deserts of the southwestern United States, it can not do so on the tree. The dates reach their full size in September or October, then dry on the tree, wrinkling more or less. There results a date which more resembles dry dates like Makantishí than Deglet Núr as it is known in Algeria and Tunisia.”*

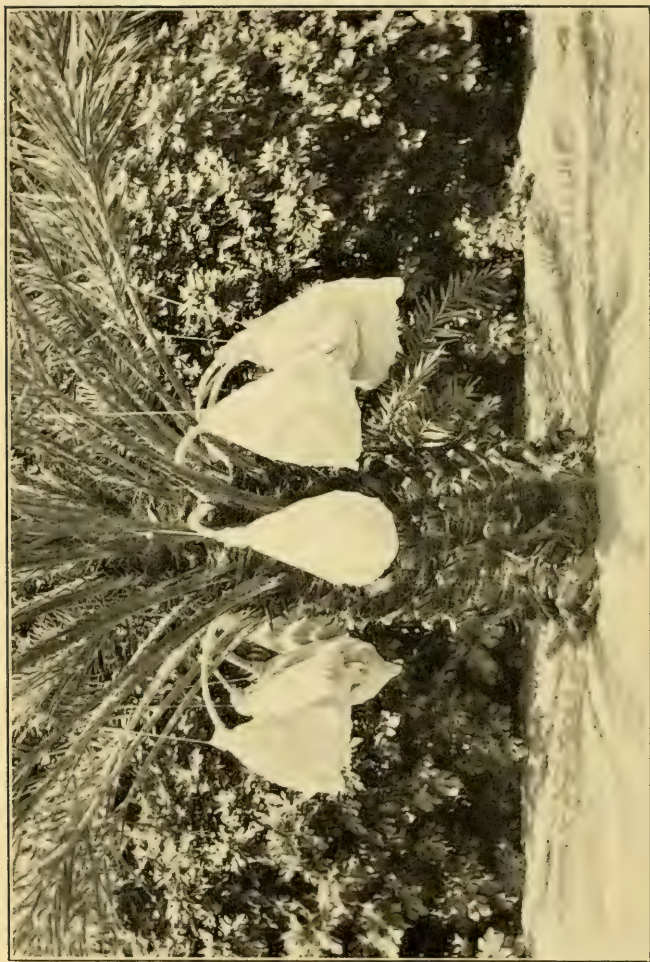
What Mr. Swingle says of dates shriveling and hardening on the palm applies especially to Deglet Núr, yet dates of all varieties have been found to give

*Dates in such a condition should be soaked in water for two days and then treated as for rapid ripening.

good results when picked early and allowed to ripen indoors. There is no secret about the method, and anyone who has a warm storehouse can utilize it for that purpose. The dates are picked when the first soft spots appear, and packed loosely in boxes which will hold thirty or forty pounds—cracker boxes are convenient and cheap. Whole clusters may be put in if they ripen evenly; otherwise the first dates to mature will have to be picked by hand, and the rest of the cluster left until a few days or a week later. The boxes are then tightly covered and placed in the storehouse, which at sundown is closed to prevent the entrance of night air; by this means the temperature in Coachella Valley will not fall much below 80°. Under favorable conditions three or four days suffice to ripen the dates perfectly; furthermore, they ripen evenly and the loss on a bunch need not exceed five per cent. They can then be packed in the usual way and shipped. Pasteurization is desirable in order to prevent the ravages of worms.

Commercial growers could well afford to build packing houses, tightly constructed and with double walls to retain the heat at night.

Artificial ripening, then, far from being a costly and delicate process to worry the grower and eat into his profits, is a simple and natural operation which will save him many cents on the dollar. For most date-growing regions, including California, dates can conveniently and economically be ripened with the slow method, which requires them merely to be picked at the right time and held for a few days in a storehouse. But to save the crop if it is hit by a rain, or to meet any sudden demand, the commercial grower should have the means of ripening his dates



PROTECTION FROM INSECTS

A bag of cheap cheesecloth is an effectual hindrance to damage to ripening dates from bees, wasps, and birds.

through rapid incubation, which will require less than a day and cost little.

Finally, in localities with special problems, such as the Salt River Valley of Arizona, special means may be required, such as the use of carbon dioxid. This will slightly increase the cost of handling the crop, but if it makes date growing profitable instead of unprofitable, the grower need not complain; and in most localities, even in Arizona, it is probable that suitable varieties can be ripened without much trouble.

DISEASES AND PESTS

CHAPTER XI

DISEASES AND PESTS

The date palm, in comparison with most other fruit trees, is notably free from disease. The unobservant Baghdád peasant, indeed, declares, "The palm has but two diseases—thirst and the chirníb," the latter being the palm borer, whose presence is too apparent to be overlooked. But in general little expense will be incurred by date growers in suppressing diseases or pests, and the possibilities of loss in this direction are very slight.

The most troublesome enemies are two scale insects, which are to be found throughout the whole date growing world, but which nowhere cause widespread damage. Their discovery, from the viewpoint of modern science, is due to Americans, but they were discovered and named by Arab scientists centuries ago.

The Parlatoria scale (*Parlatoria blanchardi*) was introduced into the United States on the first importation of offshoots, made in 1889. It is a gray insect living on the leaves of the palm, and apparently confined to that plant alone; it remains nearly dormant during the winter, but is active all summer, at the greatest growing period of the palm. It damages the tissues, but its greatest injury is in covering a cluster of dates and rendering them so unsightly that they are unsaleable.

The following description is condensed from Cockerell: To the naked eye, the scales appear as small dark gray or black specks, edged with white.

If the scale is lifted by means of a pin or the point of a knife, the soft, plump and juicy female, of a rose-pink color, is found underneath. She is feebly segmented, without legs or any other conspicuous organs except a structure at the middle of the anterior end, which is the mouth, from which in the living insect protrudes the tube through which the sap of the plant is sucked. The male scales, which are rarely seen, are much narrower and smaller than those of the female. About the middle of March the female begins to lay eggs, which will be found as minute, oval objects underneath the scale at the posterior end. Only a few are produced at a time and the total number is small as compared with that of most scale insects. The larvae begin to hatch from the egg, one at a time, about April 1. These are very minute creatures, of a pink color, with legs and antennae. They crawl restlessly about for some time, and then settle down in some place where they remain for the rest of their lives. The male, hatching from the male scales, impregnates the female and dies, his whole life being probably very brief.

Treatment of the scale by burning was introduced by the University of Arizona Experiment Station, and has since been followed. All the leaves of an infected specimen are cut closely back, and the trunk is then gone over with a gasoline blow-torch. This eradicates the scale, but the palm requires a year or two to recover from the shock and return to normal condition; it is, therefore, not a remedy which appeals to the commercial date grower.

In California a cresol dip is now used on all offshoots, and it is also used as a spray for older palms. This destroys the scale so that no danger

need be feared from it. Reinfection of a palm that has been cleaned up is easily accomplished, however, if there are infected palms in the vicinity, for the scale is readily carried by birds and animals, or even by ants and other insects.

Eventually a parasite may be found which will keep the Parlatoria scale in check. Several California lady-birds already prey upon it, while in Algeria it is attacked and perforated extensively by a parasite which has not yet been made the subject of study.*

This scale, therefore, can not now be considered as even a potential menace to the future of the date industry in the United States.

The Marlatt scale (*Phoenicococcus marlatti*) was possibly introduced to the United States at the same time, or at any rate on the following importation of offshoots from Africa. The insect is wine-colored, from 1 to $1\frac{1}{4}$ mm. long, and secretes a white, waxy substance, but not a true scale like the Parlatoria. It lives usually at the base of the leaves, inside the palm, where it is almost inaccessible, and is most active during the winter, coming out at intervals to moult. Its life cycle seems to be forty days.† It has not yet received the study it deserves, but it seems probable that when its habits are known it

*Scale on palms imported from Algeria by the West India Gardens in 1913 was found to be nearly all destroyed. An ant-like insect similar to the parasite of the melon aphid was observed on the palms, and may be the parasite; it could not be captured.

†For a more detailed discussion of the technical history of the two scales, see "The Scale Insects of the Date Palm," by T. D. A. Cockerell and "The Extermination of Date Palm Scales," by R. H. Forbes. Univ. Ariz. Agr. Exp. Sta., Bul. No. 56, Tucson, Sept. 23, 1907. Dr. L. Trabut of Algiers describes the *Phoenicococcus* in Note sur une Maladie du Dattier. Comptes Rendus de l'Academie des Sciences, Paris. T. 154, p. 304. Seance du 29 janvier, 1912.

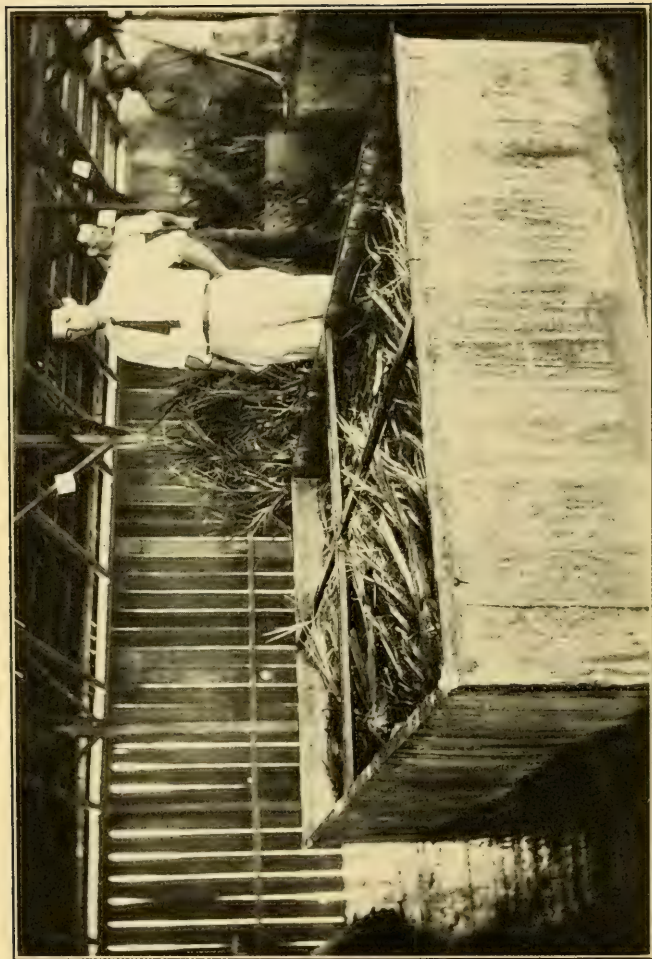
can be destroyed by a cresol spray at the time it comes into the open to moult.*

When a palm is pulled apart, masses of the scale may be seen at the base of each leaf, sometimes in such dense clusters as to look like a piece of raw beefsteak. The scale doubtless injures the palm to a certain extent by draining its vitality, and it is possible that some cases of excessively slow growth, in offshoots imported before the dip was put into use, were due to the presence of large numbers of *Phoenicococcus*. Its chief ravage, however, is rare, and appears on the fruit cluster, which is found, when it issues from the palm, to be shriveled and dry; it can not produce fruits and soon dies. The Algerian natives either pull this out bodily or treat it by putting a few handfuls of salt and ashes on it; neither method is satisfactory. When offshoots are cleaned before planting, such cases should never occur, and under present conditions it may fairly be said that the Marlatt scale is not a menace to the date industry in the United States; that it can be easily held in check, and can probably be eradicated altogether without a great deal of trouble.

No natural enemy of the Marlatt scale has been found.

At present all date palm offshoots brought into the United States must be dipped in a cresol wash before they are planted. The period of immersion is fifteen minutes, followed by twenty-four hours drying and a second immersion of the same length. This practically destroys the scale; if a few individuals should survive at the bottom of a dense mass, they can

*As the cresol dip used to combat these scales is a proprietary article, its formula has not been made public.



DISINFECTING OFFSHOOTS

They are given two fifteen-minute immersions in a cresol dip to rid them of scale and bacteria. Photo at Thermal, California.

be killed by spray the following year, when they appear in the open to moult. Care should be taken to have the dip well emulsified, otherwise it will burn the tissues of the plant. Apart from destroying the scale, it is a desirable treatment for all offshoots, as it removes bacteria which might later cause fermentation or decay, and gives the young plant the best possible start in life.

For older palms which are infected, the best treatment is a thorough spray with the same liquid, repeated several times, if necessary, at intervals of a month. Various other treatments have been used, but none of them gives much promise of value; some of them, such as carbon bisulphid, kill the palm much more quickly than the scale.

Date palms in moist regions are sometimes thickly covered with a fungus, *Graphiola phoenicis*, which injures the leaf seriously by killing parenchymatous cells, displacing the bundles of schlerenchyma and rupturing the epidermis and hypoderm. Frank* describes it as follows: "The fruit bodies appear as scattered, hard, dark swellings about 1.5 mm. across, and are sometimes surrounded by a clearer border showing the part of the leaf tissue containing the mycelium of the fungus." It is common on the coast of Southern California, but as it can not tolerate an arid climate it is unknown in the date-growing regions of the interior. On date palms in Egypt and the West Indies, however, it has been the most serious disease; and it appeared at Baghdád a few

*Die Pilzparasitären Krankheiten der Pflanzen, p. 127. Breslau, 1896. For a more technical description see Tubeuf and Smith, Diseases of Plants, p. 325.

years ago, causing real damage until it was checked.* Fortunately, it yields readily to a spray of Bordeaux mixture.

The coconut palm borer, (*Rhyncophorus ferrugineus*) has killed date palms in India and, to a less extent, in Mesopotamia—its presence at Baghdád under the name of chirnîb has already been mentioned.† It works slowly, but appears without warning. The Baghdádîs know of no remedy for it, but consider that the palm is not liable to attack if its trunk is kept well cleared of decaying fibre and leaf stalks. In India the common remedy is to put a handful of salt on the place where the insect is working, as soon as its presence is noticed by the dying of some of the leaves; at other times the native takes a fine iron hook with long handle and works around the trunk of the palm until he finds the larva and drags him out.

This borer has not yet been introduced to the United States, and there is little danger of its being introduced, but the southern states already have two representatives of the same genus—namely, *R. cruentatus* and *R. palmarum*. They are found as far west as Texas, and particularly attack the palmetto, but will be likely to attack the date palm sooner or later. They are not to be feared as a serious enemy. When they attack a palmetto grove, the best treat-

*Wajîyyeh Bey, Director of Agriculture at Baghdád, describes the malady in Lohat al Arab, July 1, 1912, p. 17, but does not identify it. He suggests lysol or sulphate of copper as the best remedy. My own identification is tentative; there are certain differences of habit between the Baghdád fungus and *Graphiola phoenicis* of California, and the former may turn out to be something different.

†I did not see the borer itself at Baghdád, and identify it only by descriptions from native friends, and the traces of its destructive work.

ment is to cut down one of the trees; its sap flows out and ferments, attracting all the borers in the neighborhood, who drink themselves to death. But this is hardly a satisfactory treatment in a date palm plantation.

Locusts or grasshoppers sometimes visit a palm grove with destructive effects. It is reported* that when they appeared at Tulare, California, in 1891, they left adjoining fields of grain and a variety of other tender plants to feed upon the leaves of the palm. In Algeria the natives have an idea that they prefer the leaves of seedlings to those of the standard varieties which are propagated by offshoots. With the development of modern methods of fighting them, there is little to fear from them as a menace to the date industry in the United States.

Rats sometimes destroy part of the crop, of which they seem to be particularly fond. A horde of migratory rats which visited the date orchard at Tempe, Arizona, a few years ago, caused great damage. At Baghdád a squirrel-like rodent has the same habit, and the growers protect a choice tree from him by putting a collar of tin a foot wide around it, at a height of three feet from the ground. This would probably be an effective treatment here, and would be a permanent protection.

Gophers are one of the most troublesome pests in some regions, and seem particularly fond of offshoots. Poison, traps, and gopher guns can all be used. In other districts jackrabbits are to be feared, and if one lives near them he should, if possible, surround young offshoots with a rabbit-tight fence.

*Shinn, C. H. "The African Date Palm," in Rep. Agr. Exp. Sta., Univ. Cal., 1891-2, p. 144.

In India ants have proved a menace to palms, the white ant being particularly dreaded. Bonavia says the best protection is constant irrigation. In Algeria, too, an ant sometimes swarms up the palm and destroys the terminal bud; the natives usually fight him with fire. I doubt if ants will ever prove a pest in the United States.

Birds, bees, and wasps all attack the ripe fruit if it is allowed to hang on the tree after it becomes soft. With artificial ripening they will cause little damage; under other circumstances a bag of cheap cheesecloth put over each cluster will prove an absolute safeguard.

This exhausts the list of principal diseases and pests of the palm,* but there are certain troublesome visitors of the stored dates which must be noticed. Foremost of these is the fig moth, (*Ephestia cautella*) and the similar Indian-meal moth, (*Plodia interpunctella*). The former is the one whose traces will be found in the imported dates of commerce, as well as in Smyrna figs, cacao beans, and other commodities; the latter has proved a particular pest in Arizona. Their habits are so much alike that I will treat them as one.†

The small, gray moth (its wing expanse is 14 to 20 mm.) lays its white eggs on the fruit, or in the basal end, if the calyx has been removed. The eggs soon turn yellow and sometimes orange, a few days before hatching. The larva when first hatched is

*The effect of excess of alkali might be considered a disease; it causes the palm to stop growth and its leaves to shrivel and change color.

†Full details are given in "The Fig Moth," by F. H. Chittenden and E. G. Smyth. U. S. Dept. of Agric., Bur. Entomol., Bul. No. 104. Washington, 1911.

delicately white, about a millimeter long; it gradually reaches a length of 10 mm., and takes on a dirty whitish, very pale greenish or very light buff color with, an overlay of rather dull pinkish tints which are arranged somewhat like longitudinal stripes on the back. It crawls about, looking for a place to pupate, and usually works into the seed cavity of the date, where its excrements will be found. In dates there are probably four generations a year. All varieties are attacked, but the softest ones by preference. At Baghdád the growers have the idea that the dry date Záhidi is less attacked than any other.

The best protection against this pest is to have a packing-house that is reasonably insect-proof, and to fumigate it at the beginning of the packing season with hydrocyanic acid gas or, in the case of small inclosures, with bisulphid of carbon. From twenty-four to forty-eight hours' exposure is desirable.

In addition to this, the dates themselves may be treated, and certainly should be treated unless it is certain that they are to be sold and consumed without much delay. In the case of dry dates they could be scalded in boiling water without injury. Other dates can be pasteurized by dry heat, three hours at a temperature of from 180° to 190° F. One of the best preventive measures, however, is to see that the calyx, or cap to which the stem is attached, at the base of the date, is left on the fruit. Fruit matured by the quick artificial process will not need to be treated.

In Arizona a minute beetle, *Carpophyllus dimidiatus*, has caused trouble of the same kind as that due to the moths. He is so small that he can pass through an ordinary window screen. The measures given above will prove equally effective to

destroy him and all other insects that infect the stored fruit.

It is greatly to be desired that every grower should make it a point of honor not to put any dates on the market that are wormy, or that have not been treated in such a manner as to make it reasonably certain that worms will not appear. Only by such co-operation can the date industry of the United States reach the position to which it is entitled.

In conclusion, let me again call attention to the fact that freedom from scale is one of the principal merits of seedling palms. Each one starts in life clean and sound, and with a little care they can be kept so. The grower can then propagate any good ones, and introduce the offshoots into any locality he likes, without fear of hindrance from quarantine laws. He cannot do this with imported offshoots until he has held them for a year. It is a mistake to suppose, however, that a tree is free from scale merely because it is a seedling: infestation can easily take place. An examination of a number of worthless seedlings, when they are removed from the plantation, will give one a fairly accurate idea as to whether he has scale or not. If he has, he will be subject to quarantine laws, but not to any other disabilities, for it has been proved that there is no menace to the profits of the date industry, in either of the scale insects, under present conditions.

THE CLASSIFICATION OF
DATES



TO INSURE A GOOD CROP

Arab date growers often have a sheep's skull on a pole in the plantation; it averts evil eye and other disasters.

CHAPTER XII.

THE CLASSIFICATION OF DATES

The question of variety is as important with dates as with other commercial fruits. In America there are nearly 400 varieties, from all parts of the date-growing world. It is therefore necessary for the grower to get an intelligent idea of the characteristics of dates of different countries, and the characteristics to be sought in those he chooses for his own plantation.

Algeria and Tunisia have been the most-worked field for varieties, up to the present. These regions are undoubtedly characterized by a greater number of insignificant varieties than any other of the orient: the number in the Zíbán* alone is sometimes estimated as high as six hundred. Of course, most of them are nothing more than chance seedlings, which are confined to the plantation of one man, and frequently to one tree. Such dates have no importance in their own country, and it is not to be expected that they could ever have in ours.

Algeria and Tunisia are further characterized by the large proportion of their varieties which are dry, and yet again by the fact that most of their dry dates are hard and of inferior quality, compared with the dry dates of other regions.

Finally, the dates of these two countries are prevailingly late. Deglet Núr is one of the latest

*The Zíbán (pl. of Záb, oasis) is the region in the northern Sahara of Algeria, of which Biskra is the center. It contains 600,000 palms; most of the Deglet Núrs and many other good varieties in the United States have come from there. South of it is the Oued Righ or Rirh, with 1,000,000 palms, the native home and chief center of Deglet Núr.

dates known, and no early ones are to be found there, as compared with Arabia or Egypt. In some ways, then, Algeria and Tunisia are the least promising of any of the great date growing regions, as a source of choice varieties for the United States.

Egypt contains more than 10,000,000 palms, but seven-tenths of them are in Upper Egypt, where they are scattered over so much territory that they are difficult of access. Furthermore, these upper Nile dates are practically all dry, a fact that was noted even by Pliny,* who ascribes it to the climate. Schweinfurth says,† “In the north Nubian Nile valley from Berber to Aswan there are only dry dates which, however, in flavor, aroma, and sugar content, as well as in size, seem to surpass those of all other regions.” These Nubian dates have not yet fruited in the United States.

In the Egyptian delta, on the other hand, the dates are large, soft, and dark in color, while rather coarse in flavor. They offer great commercial possibilities, and some of them have made excellent records in the United States.

Dates of Oman, on the eastern coast of Arabia, are earlier than those of any other region I know; half a dozen varieties can be found which ripen in the latter half of May, and as many more in June, while the principal crop is in August. They are pre-vailingly soft.

To the north of this, from the province of Hasa, formerly called Hajar, come some of the best dates of Arabia, including the famous Khaláseh. Palgrave, the only traveler who has given us a careful account of

*Hist. Nat., Bk. XIII, ch. 9.

†Gartenflora, loc. cit.

the region, says that the variety Rakáb, also limited to that province, is worthy of the first rank anywhere else.* Ever since the Arabic "Epoch of Ignorance" (i.e., before Muhammad, early in the sixth century A.D.) the dates of this region have been the symbols of excellence among Arabs, as they still are: one of the commonest proverbs, implying that a man takes useless pains, is "Like merchandising dates to Hajar"—it is the exact equivalent of our "carrying coals to Newcastle."† The dates of Hasa appear to be prevailing soft and early.

At Busreh, the greatest commercial date-growing region of the world, with not less than 8,000,000 palms closely grouped together on the combined Tigris and Euphrates Rivers, the dates are prevailing soft, of medium size, and fairly early. From a commercial point of view they are excellent, but for quality hardly equal those of Baghdád. The number of varieties cultivated at Busreh is probably smaller than in any other important center of culture, for commercial requirements have kept the grower confined to those dates which would always sell well, and that necessitated a uniform pack in which miscellaneous varieties, even if intrinsically good, had no place.

The dates of Baghdád are pretty equally divided between dry and soft, and they excel in each branch. They ripen fairly early, and are of moderate size; but the dry dates average much larger than do the dry

*Palgrave, W. G. "Narrative of a Year's Journey in Central and Eastern Arabia." Vol. II, p. 172. London, 1865.

†Another version of the proverb substitutes the name of Khaybar, an oasis east of Madína; but Doughty, one of the two Europeans who have visited it, does not speak of its dates with any enthusiasm, although he admits that they are "not unwholesome." Doughty, C. M. *Travels in Arabia Deserta*, vol. II, p. 77. Cambridge, 1888.

dates of North Africa, while they are softer and more agreeable to the palate as well. Asharasí is probably as good a dry date as the world has produced, and there are half a dozen soft dates which are as good as anything in North Africa, with the possible exception of Deglet Núr.

The dates of the interior of Arabia are not sufficiently well known to us to allow of being broadly characterized, but from accounts of native acquaintances I am inclined to think that the dates of Madína, the center of culture, average up with those of Baghdád.

The scientific grower in the United States should have a variety of sorts, but he must naturally pick them out with intelligence. If he cultivates Deglet Núr he needs no more late dates, and should offset it with some of the early ones from the Persian Gulf or the Egyptian delta. If he has early varieties he should add some of the later ones from North Africa. Other things being equal, an early date is to be preferred to a late one, because its fruit will get on the market before any foreign fruit can arrive and lower prices by competition.

Furthermore, he should not confine himself exclusively either to dry dates or soft dates, for, while the latter is the type now familiar to the American public, the dry sorts rarely fail to make friends, and there seems every reason to suppose that a market can be made for them without difficulty. On this point the grower is as competent to decide for himself as is anyone else for him; but it is worth noting that when samples of dates were offered to visitors, at an exhibition in Coachella Valley, and each was asked to express his preference, sixty per cent of them indicated

that they liked the dry dates best. It is rare to find a person who does not like dry dates at the first taste, and they have the advantage that they can be eaten in great quantities without cloying, while many cannot eat more than a few soft dates, on account of their great sugar content.

There are some dates—notably Záhídí and Tafazwín,—which are either soft or dry, according to the way they are handled. If a grower has any doubt about the merits of dry dates, he might select one of these intermediate varieties, which he could sell as a dry date if the market demanded dry dates, or as a soft date if that seemed to be preferred. The number of dry dates which can, if properly handled, be made soft dates, is probably much greater than is ordinarily supposed, and it points out forcibly the fact that the distinction between the two types is not hard and fast, but that a date can cross from one side to the other, or remain almost on the dividing line, as the grower wills. To make an intermediate class of “semi-dry” dates is certainly a useless work, for it is difficult enough to make a date stay in one of the two great classifications, and an intermediate stage merely results in profitless confusion. The so-called semi-dry classification has been particularly brought into disrepute by attempts to include in it such dates as Deglet Núr, which is a typically soft date. When this word “semi-dry” is dropped from date terminology, much of the present confusion will cease.

One of the most important characteristics for the grower to consider, when adding a new variety to his plantation, is the keeping quality of the date. Some dates are delicious when fresh, but never get

beyond that stage; they are then called "rutab" by the Arabs, and the word is so useful that it may have to be borrowed by the English language.* Others pass through the rutab stage and then cure themselves on the tree into good dates for packing or shipping, while a third class, including many dry dates, is never fit to eat while soft, but gradually dries and sweetens into an eatable fruit.

The second class is obviously the most profitable, other things being equal. The grower can have the fresh dates on his table, or sell them in that condition if the market is good; otherwise he can let them cure and sell them as cured dates, such as are ordinarily seen on the market.

The third class is worth growing if the dates themselves are good, for the principal market for dates is certain to be always for cured ones, since fresh ones will not keep or ship so well. The first class, which is good fresh but immediately begins to ferment and rot, is to be avoided (except to provide fruit for home use) unless it is particularly early. In that case—and most of the very early dates are rutab dates pure and simple—the precocity is worth some sacrifice, and as they will come on the market when it is most eager for dates, they will always find a sale.

One must regard with distrust any arbitrary statements as to the keeping qualities of a variety of date, for it necessarily depends on the grower's treatment of the fruit. One man will make a given date keep six months; in the hands of another it will spoil in two weeks after it has been taken from the

*The word means "moist," originally. It is often seen misspelled retob, rattab, etc.

tree. This is particularly true of soft dates like Ghars, and the fact that one grower has found that it did not keep well must not be allowed to condemn it without a fair trial.

Arabs have an interesting classification of dates into hot and cold, according to whether a long continued diet of them "burns" the stomach or not.* This has some importance to a people who eat three or four pounds a day for six months at a stretch—for the American public it has none. In Mesopotamia, Khustáwí is universally considered the coldest date known; Bárbán, at Baghdád, is considered the hottest, but is valued nevertheless because it ripens so early. As a matter of fact, not only most varieties, but most choice varieties, are considered hot. Among the cold ones are Khadhráwí, Sukkarí, Shukkar, Amír Hajj, and Sukkar Nabát, while Maktúm and Badráhí are placed in an intermediate class, neither hot nor cold, but satisfactory for general use. Asharasí, Tabirzál, Haláwí, Záhídí, Barhí, and most of the other dates of sufficient importance to receive any classification, are considered hot. In North Africa Deglet Núr and Thúrí would perhaps be considered the hottest, and Ghars, Yatímeh and Makantishi the coldest.

Since dates grow under a wide variety of conditions, one might easily classify them as to whether they come from a sandy, clayey, or loamy soil, but this seems to me not worth while, since it has so little bearing on their behavior in America. Dates from the heavy adobe silt of Busreh seem to do fully as well in a light sandy loam in Coachella Valley as they do in their native home. The question of

*Attention was first called to this classification by C. Niebuhr in his "Voyage en Arabie," vol. II. Amsterdam, 1776-80.

sensitiveness to frost cannot be reduced to formula, either, since it depends on the variety, and not on the temperature of the region from which it comes. In the United States, two Algerian palms, or two Egyptian palms, or two Arabian palms, standing side by side, will often show entirely different resistance.

The grower who wishes to pick out a new variety for his plantation, and to do so intelligently, should therefore consider his own needs, and then find a variety to fit them, in the index of varieties which forms Part II of this book. He will need to decide whether he wants an early or a late date, a soft or a dry date, a large or a small date, one of dark or one of lighter color, one that will be best when fresh or one that is pre-eminently a cured date, adapted to shipping long distances and keeping many months. Having decided what he wants, he will not have much difficulty in finding a variety to correspond, from the number of excellent dates which have already been introduced into the United States from the best date-growing regions of the Old World.

Descriptions of any fruit are always unsatisfactory, as they do not present a complete picture to the mind of the reader, but there are a few points in regard to date descriptions which are so misleading that the reader should be put on his guard against them. First is that characteristic "soft and sticky" which is ascribed to many varieties. It is misleading, for it depends entirely on the treatment of the fruit. A date may be soft and sticky, or it may be so firm and clean that it can be handled without soiling white kid gloves, yet it may be the same date, with different treatment in curing, according to the usage it received from different individuals. Most of the Deglet Núrs



RAVAGES OF PALM BORER

— Palms at Baghdad killed by *Rhyncophorus ferrugineus* (?); two species of same genus occur in America.

sold in the markets of Algeria are disgustingly soft and sticky, but under the skilful care of an intelligent planter they can be turned out firm and unobjectionable. The same thing is true of the Ghars, or any other soft date that might be mentioned. Let no one, then, condemn a date because he has heard it called soft and sticky, since it is the packer's fault, not the date's.

Again, the presence of fibre or "rag" about the seed is an objectionable characteristic, but it depends largely on the stage of maturity at which the date was picked, and even, sometimes, on the age of the tree. The first Manakhír dates produced in the United States were excessively stringy, but this defect has been becoming less with each successive harvest. Samples of a date described by one man may be fibrous, while those seen by another observer may be perfectly unobjectionable. One should be slow in drawing conclusions on this point.

The flavor and quality of dates is a point on which it is dangerous for any man to pronounce judgment for others. Of course, some dates can be unhesitatingly declared good and others bad, but between good dates it is impossible to lay down any binding decision. One man likes Deglet Núr better than any other date because of its fine flavor; another says that he does not like dates anyhow, and prefers Deglet Núr to any other because of its lack of flavor. Therefore, if one says a date is of good quality, that is all that can be expected; the investigator must not take any opinion beyond that without a good deal of reserve.

The characteristics of the seed are fairly constant, and form one of the most useful means of determining

the variety of a date, particularly with specimens which have been preserved so long as to have changed their appearance. Furthermore, some date descriptions are made from fruit taken directly off the tree (which is the proper way) and others from fruit that has been cured, and these naturally differ; the seed, however, remains as an unchanged factor. Arabs have long recognized the value of the seed for this purpose, and one of the famous incidents of Muhammad's military career relates to an expedition which he made to cut off a caravan from Madína. After some scouting, the tracks of a caravan were crossed, but it was impossible to say whether that was the one which they sought. Finally an Arab dismounted and pursued the track a short distance until he came upon some camel dung, in which he found a date seed. He examined it a moment and said without hesitation, "They have come from Madína." The caravan was followed and captured.*

In addition to the color and general outlines, the position of the germ pore and the appearance of the ventral channel should be noted.

Every grower should know the dates of his own plantation. If he has any good ones which cannot be identified, he should make a careful description of them, even if they are seedlings. It will always serve as a check on accuracy in the future, when the palm may have been propagated widely by means of its offshoots.

*Told in the famous classical encyclopedia of natural history, Hayet al Haywánát.

PROFITS OF DATE GROWING

CHAPTER XIII

PROFITS OF DATE GROWING

No question of the industry is more interesting than the possible or probable profits to be derived; yet none is less susceptible of a definite answer to which some one may not oppose an objection. The profits will be pretty nearly what the grower himself makes them. The only guidance that can be given is to point out what has been done, here and elsewhere, and what conditions may change these results in the future.

In the first place, I assume that the grower has a reasonably good piece of land, plenty of water, and palms of standard varieties which will produce uniform fruit of first quality. I assume, too, that he manages his own plantation, that he has given some study to the industry, and that he means business. He may get a manager who will be satisfactory, but he may not, for such men are scarce in any agricultural enterprise, and are not likely to be attracted by the ardent summer climate of a date-growing region. They are likely to feel as a newly-arrived Turkish governor of Baghdád is alleged to have done. He spent the whole of his first day complaining of the heat:

"But, your excellency," his attendants assured him, "we need this heat to ripen the dates."

"Oh, you do, do you?" he exploded, "I'll not suffer on such a flimsy excuse as that. Order all the palms cut down at once!"

Date growing is not a "get-rich-quick scheme," but if a man gives to it the attention that would be

necessary to make a success of any other business, he should make a success of growing dates. His profits will depend first on the size of the crop, and second on the price which he receives for it.

As to the first, the usual estimate in the United States is 100 pounds for each adult palm, per year. For most varieties, including Deglet Núr and other dessert dates, I believe this is a conservative estimate. Let us check it up by the experience of other people, bearing in mind that a palm should yield more in the United States than it would in another country, because it should get better care.

The Algerian government estimates* the annual production of a Deglet Núr palm at 40 kg., or 88 pounds, but declares that this is probably an underestimate. As Deglet Núr regularly bears more heavily with us than it does in its original home, 100 pounds seems a reasonable estimate here. Most of the North African varieties bear more heavily than this. For Tunis, Masselot† considers Lúzí to be the shyest bearer, with an annual yield of 55 pounds, and Ríshtí and Hamraya the heaviest, at 220 pounds each. The average of 92 varieties which he has investigated is 116.5 pounds per tree.

In Egypt, the English estimate a yield of 172 pounds per tree,‡ and yet the trees are set much closer together than in the United States.* Egyptian varieties bear more heavily than those of some other

*Les Dattes en Algerie—Supplement au No. 6 du Bulletin de l'Office du gvt. genl. de l'Algerie, 1910, p. 81.

†Bul. Direc. Agric. et Comm., Tunis, vol. VI, No. 19, Apr., 1901.

‡Sir H. Rider Haggard, "An Egyptian Date Farm." London Times, Oct. 11, 1912.

*At the great Pyramids Estates near Gizeh they are set twenty-two feet apart or eighty-seven to the feddan, or acre.

countries; a yield of 250 pounds for Birket al Hajji in Arizona is not considered exceptional.

In the Sudan the average yield, according to official returns,* is 160 pounds.

Indian palms are so closely crowded, as many as 139 being set to the acre, that they do not get a chance to do well; yet even under these circumstances Milne estimates the average yield at from 40 to 120 pounds, while Bonavia says the average in the district of Multan is 160 pounds.

All of these estimates are the work of trained scientific observers. When we turn to the Arabs we cannot feel the same confidence, but I have checked up their estimates in many districts and believe I have reached correct figures.

At Baghdád, a palm which yields less than 100 pounds a year is considered a very shy bearer indeed. Khustáwí, for instance, is so considered; but even with the lax Arab methods of cultivation it averages from 75 to 125 pounds, while a crop of 300 pounds on Záhídí or Bárbán is quite ordinary. Conditions are about the same at Busreh and in Oman; I would put 150 pounds as the average yield of a good palm.

What can be done elsewhere can certainly be done in the United States. Any one can find out from the growers what their average yields are, and if he does so, I am satisfied that he will admit that the figure of 100 pounds is very reasonable.

Of course, exceptional yields can sometimes be found. A crop of 500 or 600 pounds is not rare among Arabs, and has been closely approached, if not equaled, in America. If we could secure some of the religious

*Report from gov. genl. of Sudan to gov. genl. of Queensland, in Queensland Agr. Journal, vol. XXVII, p. 131, Sept. 1911.

atmosphere of Muhammad's home we might do even better, for Faqir Amin al Madani says, "we have seen and bear witness as to palms, that some palms bear, each one, verily, three ardabs* of dates."

With 100 pounds per tree and 50 trees to the acre we have an annual yield of 5000 pounds, or two and one-half tons, of dates to the acre. The price at which these will sell has been the subject of much difference of opinion. At present it is not difficult to sell the highest grade of dates, well packed, at \$1.00 or more a pound in California. There is no reason why this price should not be maintained for some years yet, while home-grown dates are still a novelty. It certainly will not be maintained permanently, but there will always be a demand for the finest dates, packed like confectionery, at confectionery prices; and even if such a demand is limited, it will probably be big enough to offset the quantity of second-grade dates which must be sold at 10 or 15 cents a pound. As to the bulk of a crop of dates from palms of standard varieties, properly handled, my own idea is that the price is never likely to fall below 20 cents a pound to the grower. This I offer as an average price—there will be many culls that must go at a lower figure, but there should also be a considerable amount of fancy fruit which will bring two or three times the sum mentioned. Taking the average at 20 cents a pound to the grower, with the conservative estimate of 100 pounds to a tree and 50 palms to the acre, we may calculate on a gross annual return from a well-managed plantation of \$1000 per acre.

*As a measure of volume, an ardab is slightly more than five bushels. As a measure of weight, it varies according to the commodity; the ardab of dates is now 320 pounds.



CURING DATES ON HOUSETOP

The universal practice in the orient. The variety is Khasab, one of the latest to mature in Samail Valley, Oman, Arabia.

This should begin with the fifth year. In the third year some varieties should bear enough fruit to pay the cost of up-keep, and in the fourth year to return a fair profit. From the fifth year they will bear well for a century or more.

This figure takes no account of the production of offshoots, which, with choice varieties, promises for some time to be fully as valuable a product as dates in the United States. Some remarkable records have been made already in this respect, but to be well within the limit of probability we will assume that each tree yields only one offshoot a year, from its fifth to its twentieth year of age. Such a production should not diminish the yield of dates, while if the offshoot is sold at \$5 (a price considerably below that now current), it will increase the annual gross revenue of the plantation by \$250 per acre; and it is probable that with most varieties two offshoots a year could be taken from the palm, without reducing the average yield of fruit below 100 pounds. This would make the annual gross return of the plantation \$1500 per acre. I believe that the offshoots alone will be, for some years, of sufficient value to pay all expenses of running a properly managed plantation in the United States, leaving all returns from marketing fruit as clear profit.

This would mean, under the best conditions, \$1000 a year per acre net profit from a plantation. This estimate does not agree with many others that have been put forward, and in such a case each man may weigh the evidence and judge for himself. Many think the price of dates will be much higher than I have assumed, and I am far from saying that they may not be right—in fact, I know they are right so

far as the immediately succeeding years are concerned. Those who get into the date industry at once in the right way can make profits that, for a few years at least, will be extraordinary.

Others consider that the expense of running a plantation will be so great that the profits will be much less than my figures. I readily agree that this may be the case with some plantations, for poor managers are to be found in any business, and some men cannot make a success of any walk of life. But knowing as I do that date growing requires less trouble than most other industries, and believing that the expense of producing dates will be less than that of raising almost any other subtropical fruit, I believe that the cost of keeping up a plantation will be reasonably small. I shall discuss this question in more detail later, but I want first to speak of the probable prices of dates in the United States, since that is a main factor on which the amount of profit depends.

At present, imported Busreh dates, very badly packed, rarely sell at less than ten cents a pound in the United States, while better packed ones, and Fardh dates, (which are popular because they are firm enough to keep their shape, although in flavor they are second rate) sell at fifteen or twenty cents a pound. The importers could cut this price and still make a good profit, for Persian Gulf dates can be laid down in New York at less than five cents a pound. But I doubt if they can improve the packing to a marked degree, and that is as important as the price. Furthermore, they cannot get these dates on the market before the latter half of October, and dates of a similar grade grown in the southwestern States can be put on the market a month or two earlier than that,

while it is devoid of dates, and be sold off before the foreign importations arrive. I therefore see no reason why the competition of imported Persian Gulf fruit should lower the price of an earlier and more attractive local product.

The French in Algeria can put out Deglet Núrs, however, that are packed in an attractive manner, and owing to cheaper labor can probably do so more cheaply than we can. At present choice dates, well packed, sell at twenty and twenty-five cents a pound in France and Algeria, and as the demand is steady the price will hardly go lower than this. They might conceivably interfere with the sale of American dessert dates at fancy prices, such as \$1.00 a pound, but their competition can hardly be considered if twenty-five or thirty cents a pound retail is taken as the basis for calculations.

Furthermore, the market for fresh dates will always be a local monopoly, and I believe it will be a profitable one, for the fresh date is not too perishable to be shipped, and is liked by every one who tastes it.

The total annual consumption of dates in the United States is now in the neighborhood of 32,000,000 pounds a year, or something like five ounces per person per year—a ridiculously small figure. The great food value of the date allows every one to purchase it as an integral part of the family diet—not as a luxury or dessert, but with the feeling that it is a part of his nourishment. Furthermore, the American public now scarcely knows the value of the date in any form except raw, and the teaching of methods of cooking it will increase the consumption. So far as the factor of supply and demand goes, I believe that the consumption of dates will far exceed the

production in America for many years, and that locally-grown dates will hardly find competitors in the imported fruit. As people come to know what delicious, clean, fresh, home-grown dates are, the price may be expected steadily to rise rather than fall, no matter how fast the production increases in California and Arizona.

These are the reasons which lead me to believe that an estimate of twenty cents a pound gross return to the grower is conservative. Others may figure on a different basis or, figuring on the same basis, arrive at a different conclusion. Any one interested in the industry can consider the facts and from them form his own estimate.

To return to the probable expense of running a date plantation: it should not be large, as compared with the expense of other agricultural enterprises. The difference between good and bad management is so great that one can hardly quote definite figures, but it may be pointed out that the amount of labor is not great at any time of year, and that even during the picking of the crop fewer men will be needed than with many agricultural staples. If the owner is his own manager he will have all the profits for himself, so there is certainly a great future in the industry for men who own plantations of ten or fifteen acres. One man should be able to keep up such a plantation alone, at all times of the year except during the crop picking season. If a manager has to be hired the expense will be greatly increased, unless on a large estate, for only a thoroughly competent man can be considered. In a favorable situation such as Coachella or Imperial Valley the expense of picking the crop is not great; if it is ripened by the slow

artificial method the cost will be nothing save that of the little labor required; and the expense involved in marketing is less than that with most fruits, because the date is not perishable, does not need to be kept in iced cars or cold storage,* and can always be held for a favorable market. As the industry is new, there is naturally much yet to be learned about marketing dates to the best advantage, but that is a problem which Americans are well able to handle, and when date-growers have as efficient a co-operative organization as the orange-growers of California, the percentage of profit to the owner will be very high.

Perhaps the safest and most helpful way to consider the cost will be to make a comparison with the cost of lemon-growing in this state. Any other industry would do, but I take the lemon growers because information regarding their operations has been collected with particular care.

Citrus fruit lands with water are valued at from \$400 to \$500 per acre. Date lands with water can be had for much less. The expense of bringing a lemon grove into bearing, including the cost of land and water, is from \$750 to \$1200 an acre. The cost of clearing, grading, and preparing the land for planting may vary from \$10 to \$15 an acre, of irrigation ditches and flumes from \$15 to \$50 per acre, and of the trees and planting from \$75 to \$150 per acre. The annual care of the grove is from \$30 to \$100 per acre up to five years of age. These estimates should all be sufficient to cover the expenses of a date plantation, with the exception of that of cost of trees. Owing to the rarity of offshoots of the choicest varieties one must allow \$300 an acre for

*In fact, it quickly moulds if so stored.

the palms. In the end this will be counterbalanced by the fact that the life of a date plantation is far longer than that of a lemon grove, and the loss of five per cent to ten per cent of the trees yearly, which is allowed by citrus men, need not be considered by date growers.

Lemon groves are plowed in the spring both ways, and are cultivated between the irrigations. The cost of plowing and cultivating averages about \$35 per acre each year. The groves are irrigated every month or six weeks from spring until fall; the cost of water averages \$15 per acre, and the labor of applying it \$1.00 per acre. As dates require more water, these figures will probably not be high enough for the palm plantation.

Lemon groves are heavily fertilized with manure or chemical fertilizers, or with both, the growers using from \$20 to \$120 worth of fertilizer per acre per year. Here the date grower will make a great saving.

It costs \$15 per acre yearly to prune citrus trees. It should cost less than one-third as much to trim the palms, and this expense will be practically negligible until the plantation has reached full bearing.

Fumigation and spraying of citrus groves costs from \$5 to \$10 per acre, often much more, and must be regularly done, while the palm plantation, if properly started, should never require expense of this kind.

In most districts citrus trees have to be protected against frost during winter months. Smudging costs about \$20 per acre per year. Date growers will never have this expense.

With all these expenses the cost of growing each crop of lemons up to the time of harvesting is approximately \$197 per acre. The upkeep of a date plantation should be well below this. Expense of handling the crop should be much less than with citrus fruits, because of the saving of icing charges and long railway hauls, since all dates grown can undoubtedly be marketed in the west for many years.

If we take cost of land and water and expense of bringing a lemon grove into bearing as \$1000 per acre, which is very near the average, we can safely assume that the expense of a date plantation will be less, since land is cheaper and labor little, if any, higher, while the additional cost of trees to the date grower is offset by the saving in many items of cultivation. It should be noticed, too, that this estimate for lemon groves, covering five years, includes the pay of a foreman. The date-grower who manages his own plantation will save this, while he should be getting considerable returns from his dates before the fifth year, and may also grow a secondary crop. If we say, then, that \$1000 an acre is an adequate investment for land, water, and the expense of bringing a date plantation into bearing, we should be well within the truth.

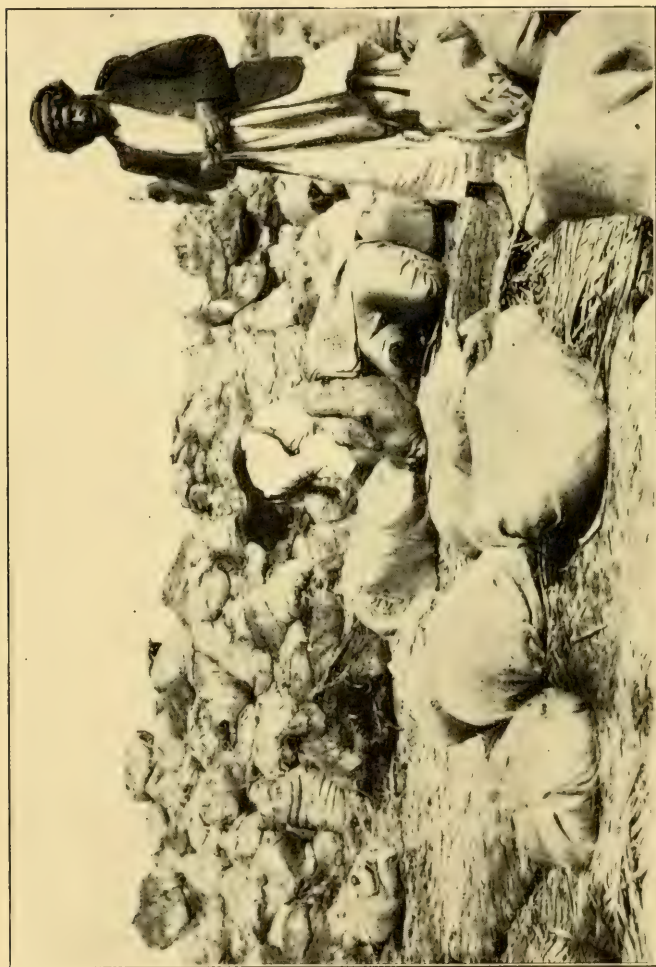
The annual upkeep of a lemon plantation, not including picking or marketing the crop, is about \$200 per acre. Even with the added water and cultivation needed, annual upkeep of a date plantation should be less than this, in view of the great saving which the date grower makes in fertilizing, fumigation and frost protection.

When it comes to picking and marketing the crop the date grower has a great advantage, for he is not

dealing with a perishable commodity like citrus fruits. It costs the lemon grower more than \$300 per acre to handle the crop; the cost of picking and marketing 5000 pounds of dates per acre ought to be considerably less than this.*

We find, then, that the date grower has the advantage of the citrus grower so far as cost of production is concerned, while his profits from the sale of fruit are much greater. There is every reason to believe that the grower can bring a date plantation into bearing, including the cost of land and water, for not more than \$1000 an acre, and, after it is in bearing, pay the entire expense of upkeep, for some years at least, by the value of his offshoots, leaving all the income from the fruit as profit; and this net income ought to be, in a well-managed plantation of the best varieties, not less than \$1000 per acre per year. For the first few years, while fancy prices prevail, the grower may secure a much larger annual net return if he is keen enough to grasp the opportunities. And since he may pay a large part of the expense of bringing his plantation into bearing by growing a subsidiary crop, we may well conclude that there are few agricultural opportunities today more attractive than that presented by the culture of the date palm.

*All the information regarding the citrus industry is from Bul. No. 9 of the Citrus Protective League of Cal., Los Angeles, Jan., 1913: "The California Lemon Industry," by G. Harold Powell and F. O. Wallschlaeger.



DATES FOR NATIVE TRADE

Poorer fruit is packed in palm-leaf bags at Basrah, and these are sometimes sewn in burlap, as well, for export to gulf ports.

ARAB USES OF THE DATE

CHAPTER XIV

ARAB USES OF THE DATE

As a general rule the Arab eats his dates raw, out of hand, just as the American does. In this way he can dispose of astonishing quantities day after day:—the explorer Nachtigal tells of natives who often ate six pounds between sunrise and sunset, in Tripolitania, and thousands of Arabs, whose principal food during half the year is dates, consume several pounds a day regularly throughout their lives, and are among the healthiest and most vigorous members of the human race.* It will usually be found, when a traveler reports Arabs suffering from too many dates, that their troubles are due solely to the fact that they eat the fruit when it is half ripe, in which case it tastes something like a green persimmon. It is not dates, but tannin and free organic acids that are to blame in these rare instances.

Nevertheless, it is natural that the Arab should seek to vary this diet in such a way as to make it less monotonous, and to add to it the protein element which the date lacks. In the Sahara, ever since the middle ages, there has been in some regions a superstitious idea that the meat of dogs was the ideal accompaniment to a diet of dates, and dogs are even today fattened for food purposes in parts of Morocco and Tunis and in the Zibán of Algeria. Such a habit could hardly have originated, or persisted, among a

*Date growers can not expect the per capita consumption in America to reach such a figure. Nevertheless, they tell a story in Cairo of a young American woman who ate seventy-five dates as the finish of a hearty dinner!

more purely Arab race, for the dog is to the orthodox Muslim an unclean animal, and Muhammadan geographers notice this habit with unconcealed scorn.* Even today the gamins of Biskra take all the conceit out of a pompous visitor from the Záb by a piece of doggerel which they shout at him in the street, taunting him with the loathsome nature of his diet.

On the authority of Muhammad, cucumbers are also considered a particularly good accompaniment for dates. The prophet is quoted in the Traditions as saying, "the cold of the one counterbalances the heat of the other and the heat of the one diminishes the cold of the other," a piece of absurdity typical of popular Arab medical lore.† As a matter of fact, the only advantage cucumbers might have would be to dilute the sugar in the dates, which water would do just as well. Probably the universal habit of drinking milk with dates is principally due to this same need—anyone who eats a lot of sugar will realize that nature calls for a drink. Milk has also the advantage of adding a little fat and protein to the dates and making a well-balanced diet; accordingly it will be found that most of the Arab methods of using the fruit are based on this principle.

The simplest way, and one of the most popular in the Sahara, is to split the fruit, remove the seed, and then fill the cavity with a chunk of butter; this is usually done at the table as they are eaten. Of course the butter for this purpose must be unsalted. This manner of eating the date has been popular

*Cf. Jean Leon, *Descr. de l'Afrique*, p. 40. Lyons, 1556.

†Jalál al Dín Abd al Rahman Muhammad al Suyúti (c. 1475 A. D.), tr. by Pharaon, Paris, 1856.

throughout the Arabic world for centuries, so that it has even been recognized by the poets; a well-known stanza contains the lines:

“I placed some butter upon a date,
And both the food and the condiment
were rendered delicious.”

At Baghdád and in other regions where buffalo cream is available, it is allowed to clot thickly, and used as a substitute for butter.

The names of dishes made in this manner are numerous, and not worth repeating here, but one of them is too famous in literature to be ignored—it is called *khábís*,* and its invention is ascribed to the time of Muhammad. His friend 'Uthman b. Affar is named as the inventor; it appears to have consisted of dates, butter, and honey, and the merit claimed for it is that inferior dates taste as good as the choicest when prepared with these accompaniments. When the amateur chef had concocted this dish he carried it to Muhammad, who sampled it and, lifting up his hands, cried, “O God, set aside thy best favors and accord them to 'Uthman!” The word *khábís* has accordingly taken on the figurative meaning of “complete happiness.”

Sour or curdled milk in various forms is a constant accompaniment of dates, and even to an occidental palate they are delicious with cottage cheese or *smierkase*. Finally, fresh milk, especially that of camels, is considered a particularly fitting drink after a meal of dates; it cools the stomach and “refreshes” the partly-digested fruit.

Dates can be eaten raw in various other

*Described in the *Qamús* and in a manuscript of Al Suyúti, quoted by De Sacy.

combinations, however; in the Sindh desert of India onions are considered the proper accompaniment. When the dates ripen, everyone hastens to eat as many as he can hold; when he is replete he eats a raw onion, and is then able to start on dates again.

In districts where locusts or grasshoppers are obtainable, these insects are roasted and pounded to a paste together with fresh dates. The date paste known as *madquqeh* is also a standard article throughout the orient; it is merely seeded dates pounded up with sesame oil, and is commonly used as a spreading for the tasteless native bread.

These combinations are all made with uncooked dates, but there are plenty of ways in which the fruit can be cooked. Probably the best is a plain fry in plenty of butter; the dates for this purpose should be soft, and great care is needed to keep them from burning; but if properly prepared they rarely fail to please an American palate. Fresh dates are also baked in the oven, sometimes being basted with butter. They are particularly popular with American missionaries in Egypt when cooked in this fashion. Another standard Arab recipe is to chop up the dates and boil them in milk, often with the addition of chopped onions and a flour thickening. One of the specialties of Baghdád cooks is fried dates and eggs, particularly in the form of an omelet. A stew of dates with rice and milk is considered most appropriate for women at childbirth. In the Sahara dates are added to meat soups and stews, but the result does not commend itself to occidental tastes. The locally famous "Date Sweet" of the Persian Gulf region, which is made at home but never sold, consists of dates ground very fine, fried in oil, mixed with flour boiled in milk,

and then made into cakes. The Persian-Indian preparation called bhugrian consists of ripe dates boiled and then fried in oil; it has the merit of keeping a year or more.

Often dates are pickled just before they are ripe, and pickled in vinegar, when they much resemble pickled walnuts.

The fruit lends itself particularly well to the manufacture of preserves and jams. One of the best is the mu'asal of the Persian gulf, which is made by American missionaries at Busreh as follows: Remove the seeds from dates and replace them with walnut meats. Boil down some date syrup (any other good syrup would do), add sesame seeds to taste, and a little rose water for aroma; boil until thick, add the dates, put over the fire and let it come to a boil again; then put into tins or glass jars.

Here is the Syrian method of preserving dates* (it is almost identical with that widely used in Egypt): Take the largest dates obtainable, preferably before they are entirely ripe; peel them with a sharp knife, put them in a pot, add a little more than enough water to cover them, boil until they are soft; then slip the seeds out and put an almond or pistachio, with a clove, in the cavity; boil the dates in syrup with a little lemon peel until of the proper consistency; take them off the fire and let them stand over night; then bring to a boil again and put into glass or glazed jars.

Sometimes choice dates are preserved without cooking, as in the khurma shirah of Persia, for which the choicest dates are dried in the sun on mats,

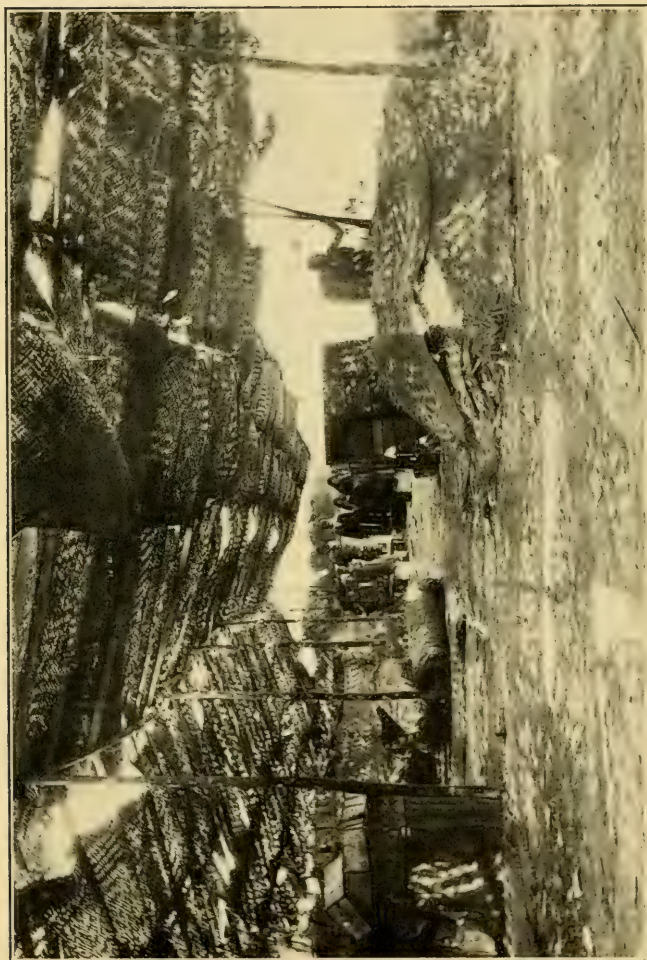
*From Khalil al Núra's cook-book, "A Tax on the Eyes for the Comfort of Stomachs," Bayrút, 1895.

protected from the dew at night, until they are cured. Then they are washed with diluted date syrup, to free them from dust, and after draining are mixed with sesame, powdered ginger, walnut kernels, and other spices. They are packed by pressing in jars, the jars being filled with thick date syrup and made airtight.

This date syrup is itself one of the most valuable by-products of the date, and the activity in Arab kitchens during the date harvest, when the syrup is being prepared for the coming year, resembles that during fruit-canning time in other countries. In the best homes of Baghdád it is made as follows: Soft, seeded dates of the juiciest varieties are placed in a large pot and allowed to soak in water for a day or two, then boiled thoroughly. The dates are next placed in a closely woven basket to which heavy pressure is applied, and the juice drips into the pot containing the syrup resulting from their boiling. The pot is then allowed to stand in the sun for a week, until the syrup is as thick as honey, when it is ready for use. It sells in the market in winter at ten cents a quart.

Not only the fruit but its seeds as well are used in cookery, particularly during periods of scarcity. They may be soaked in water until soft, then pounded and boiled with milk; but more commonly they are made into bread, for which the old writers give many recipes that look somewhat dubious, particularly when they call for the addition of drugs and chemicals. The simplest is that given by Ibn Awám:* Pound the seeds in a mortar, put them in a jar of brine and let them stand for several days. Add a little vinegar

*The Book of Agriculture, ch. XXIX, art. 13. He gives it on the authority of Quthámí, who had it from Jambushad.



PACKING SHED AT BUSREH, ARABIA

In such places often under trade name of "Golden Dates," are packed the Hulawi, Khadhrawi and Sayir dates exported to America.

and simmer until they become a paste, then knead it up and boil it. The paste must be well salted, and not allowed to cool off at any time while it is being cooked. When the mass has become absolutely soft, which will require several days of simmering, work it up in fresh water to eliminate the vinegar and salt, then dry the paste, grind it into flour, and make pancakes of it.

More frequently, however, the seeds are used for animal fodder, either soaked or not. In many parts of the Persian Gulf region the standard ration for milk cows consists of date seeds and fish heads. In India half a century ago a company was organized which manufactured a palatable coffee substitute from date seeds, but it seems never to have met with popular favor.

The spathe of the palm (usually the male) is sometimes cut before it has opened, and ground up to make bread, while the male blossoms, when fully formed but before the spathe has opened, are a delicacy in all parts of the orient, either raw or as salad with lemon juice. They are supposed to have an aphrodisiacal quality. Sometimes they are boiled with lemon rind. In times of scarcity even the younger leaves of the palm are boiled for a salad, while the terminal bud is always a delicacy, raw, boiled, or ground into a meal.

The medicinal uses of the date would fill a book, for the empiricists of the Arab profession can see medicinal qualities in anything. This use of dates goes back to prehistoric times: two thousand years ago Pliny could speak* of their employment by "the ancients" to recruit the strength and allay the thirst of a patient. The authorities differ considerably

*Hist. Nat., Book XXII, ch. 51.

in their opinions as to the exact merits of the fruit, but the statement of Dáúd al Dantákí is as good as any for a specimen. He declares,* "Dates are hot to the second degree, dry to the first. They cut short a persistent cough or pain in the chest, and banish throat trouble, particularly if eaten first thing in the morning. They are useful cooked, or preserved in syrup; they fortify the body and strengthen the blood and cure pains in the back and invigorate the loins when they are atrophied; and if boiled in milk and drunk they cut short fever and ague; they also cure foul mouth and, taken in milk, are a tonic for the appetite. Dates ought to be given to a sedentary patient with great caution, and not at all in hot weather; in order to be useful they should be eaten only by one whose blood flows freely, and who has no tendency to atrabiliousness. In other cases they would produce itch, bad teeth, diseases of the gums, and general languor and sleeplessness."

Dates pounded up with the leaves of *Juniperus occidentalis* are considered by the belles of Algeria to be particularly fattening.

Without going into the subject at greater length, I can say truthfully that, if one believes Arabic authorities, there is practically no ill which cannot be cured by one of the products of the date palm. On the other hand, there are only a few that may not be caused by them, if we believe other empiricists. Ibn Baytár is perhaps the most pessimistic of writers, and he quotes† a long list of authorities to show the

*Shaykh Dáúd al Dantákí, the Blind. The Book of Medicinal Drinks and Collection of Wonders (MS. in my possession), ch. 7. He professes to base his work on that of "The wise, the experienced, the wonderful, the one and only Jalínús," i. e., Galen.

†Ibn Baytár, Treatise on Simples, tr. by Dr. J. Sontheimer. Stuttgart, 1840.

dangers, real or imaginary, arising from dates. Eaten before they are ripe they cause skin eruptions, fever, headaches, constipation, stomach and bowel troubles, and injury to the gums. When ripe and fresh they are more dangerous than when cured; but he admits that they may be valuable to thin thick blood, and closes with the caution that persons with hot temperaments should always eat their dates with vinegar, fermented honey, fresh greens, sour milk, or acid pomegranates. To recover from such an attack we shall have to fall back once more on Muhammad, who advised his followers to eat fresh and cured dates together whenever they could, in order to thwart the devil, because that personage has said: "Man will remain as long as he mingles the new with the old." This is related by Abd al Rizzáq,* who adds comfortingly that "the sap of palm leaves is a sure remedy for nervousness, kidney trouble, and putrid wounds; it calms the effervescence of the blood and is a tonic for the stomach."

Although the Muslim's religion prohibits the manufacture of intoxicating drinks, this law has never been strictly regarded, so the Arab not only makes a variety of "soft" beverages from the palm, but several that are decidedly alcoholic and others which are on the dividing line. The last are popular, for if it is granted that their use is lawful when they are newly made, one may drink them when they begin to ferment and yet ease his conscience by refusing to recognize that such a process is taking place—a moral and mental phenomenon that is familiar enough in the case of hard cider in the Occident. Thus palm

*Abd al Rizzáq al Jazairí, "The Relation of Enigmas" (seventeenth or eighteenth century A. D.). Tr. by Dr. Lucien Leclerc. Paris, 1874.

wine will be consumed by a man who gets roaring drunk on it and yet can make himself think that he is keeping within the letter of the law.

The palm wine or laqmi* has always been a specialty of North Africa, where its manufacture assumes really large proportions, to the point of having recently been forbidden in most parts of Algeria and in Tripolitania, because of the damage which owners were doing their palms in their endeavor to keep themselves provided with the beverage. The season of its manufacture is from May to October and the method is as follows:

A V-shaped incision is made in the terminal bud and an earthenware jar fastened under it. This is usually emptied morning and evening. The flow will continue for three months; sometimes four or five quarts will be produced in a single night. The yield varies from day to day; some varieties also give more than others. In any event, the tree will produce no fruit for several years afterward; but if it is allowed to recuperate for such a length of time it can then be tapped again. The second tapping usually kills it, although it may undergo a half a dozen.

The sap closely resembles coconut milk in flavor, but is a little sweeter. It quickly begins to ferment, the process being hastened by the dirty condition of the vessels in which it is usually kept; and if allowed to stand in the sun for a day or two, a quart is sufficient to start several fights. It is also made intoxicating by the addition of seeds of the rue (*Ruta graveolens*).†

*It is often called lagbi: the name appears to mean nothing more than "swallows" or "mouthfuls."

†This common plant, known to the Arabs as harmal, is one of the most valued in their materia medica; Muhammad declared that it cured seventy-two diseases and the physicians have ever since

The orthodox Keeley cure consists in mixing a little crow's blood with the wine; the consumer, it is declared, will never want to touch another drop. But the French authorities in North Africa have found a light fine or a few days in jail more effective.

Formerly the industry was licensed in Tripoli, each tree tapped paying a tax of \$4 per year, and it was calculated that the annual income from this source to the government was more than \$15,000, while the natives made from fifty to sixty cents per day from each tree.*

Sometimes whole oases have been subjected to this process, when the well which supplied them had dried up. In such cases it is a legitimate operation, but it is not likely to become an established industry in the United States, although it offers an interesting way of getting rid of worthless seedlings.

Next to this, the most important beverage made from the date is arrak,† which keeps five distilleries busy in Baghdád alone, and the consumption of which is getting a strong, although concealed, hold on a large part of the Muhammadan population. Dry dates are the best for this purpose; in Baghdád Záhidi and in Egypt Ibráhímí get the preference. At Baghdád the product is often made from dates and grapes in equal parts, and always in the simplest manner. The fruit is allowed to ferment in water, and then double distilled, sugar and aromatics being added. It is interesting to note that wormy dates are reported to

been trying to find out which they are. The commonest use in the Sahara is as a paste to rid the head of undesirable citizens.

*See report of Cons. gen. Lago in Brit. Foreign Office Rep., June, 1900.

†Properly araq; the name means simply "sweat", alluding to the condensation of vapor when it is distilled.

yield twenty per cent more liquor than fresh and sound ones. The five stills at Baghdád, all owned by Jews, turn out a total of 500,000 litres per year, which is worth from twenty to thirty cents per litre. The effects on those who drink it are said to be practically the same as those of absinthe.*

Laqmí is sometimes distilled, furnishing an intoxicant which much resembles arrak.

The beverage called nabídh has already been mentioned in Chapter I; it is made by pouring water on macerated dates and letting it stand over night, and is rarely relished by Europeans. It remains popular in Arabia and Egypt; in other date growing regions it is hardly known.

A rather palatable drink is made by macerating dates in milk, which is sometimes, but not always, boiled. It goes by various names in different regions, and according to the details of manufacture; it is of course taken when quite fresh and is lawful to the Muslim.

A kind of beer is sometimes made with dates and barley, to which yeast is added. It is considered lawful if it is not allowed to ferment beyond the point of slight acidity.

This includes, I believe, all the types of beverage made from the date; but the list of varieties, as given by Arab authors, is long, the same drink being given many different names, as the method of its manufacture is slightly varied or the locality changed. And now that I have covered the subject of drinks, as such, let me return for a moment to laqmí to note a few unappetizing details of scientific interest.

*A good account of the arrak industry at Baghdád is given by G. Ghanimeh in *Al Machriq*, No. 11, p. 480, Bayrút. June 1, 1907.

Herodotus mentions* that the ancient Egyptians used this beverage for washing out the ventral cavity of an intended mummy; and Ibn Awám declares that, spiced with myrtle and cummin, it is unequalled for ridding the hen roost of lice. I may add, finally, that lately it has been advertised in Europe as a cure for tuberculosis.

*Herodotus (c. 450 B. C.), Book II, chapter 86.



PACKING DATES IN THE SAHARA

The popular but inferior dry date Degla Baydha is shipped to Europe in large quantities for the manufacture of alcohol.

FOOD VALUE OF THE DATE

CHAPTER XV

FOOD VALUE OF THE DATE

by Charles L. Bennett, M. D.

In the arid regions of the old world dates have always been an essential in the dietary, and in some parts have been used even to a greater extent than bread and potatoes here. In fact, without dates much of the world's history would have been differently written unless a substitute, as effective as the date, could have been found for the tribes of desert regions. The date made their activities possible.

Owing to its compact form and almost total availability as food the date is a natural tabloid form of nourishment, and some kinds even outstrip the much vaunted pre-digested foods. These latter dates contain sugar in a form immediately available by the body through simple absorption without being subjected to the digestion that ordinary sugar undergoes.

So it is that the Persian, the Arab, and the North African have always found the date a great boon and ideal food, with only sufficient padding to favor intestinal function, carrying predigested material, ferments that aided its own digestion, and an attractive flavor. The drier dates kept well on long journeys and never cloyed the appetite. An active hard working desert dweller ate pounds of them a day; they formed almost his sole food for long periods, and often for many months his only addition to the date diet was an occasional small amount of meat, milk, or rice.

Dates are at once an enjoyable confection and a substantial energy producer. They really contain all the elements that a balanced diet calls for, protein, fats, salts, and carbohydrates, and all in available form for the human system. Proteins form the pivotal point or central building block in the animal cell. The date does not contain sufficient protein to be a tissue builder. But the cell nucleus must surround itself with energy producers, with physiological fuel, and here the date comes in with its seventy to ninety per cent. carbohydrate content.

One pound of dates has a calorie value of 1,275, a calorie being the physiological heat unit or unit of potential.

A workman of ordinary build and weight at ordinary hard labor will require 3000 calories per day of fuel or food energy. It can readily be seen how far two or three pounds of dates per day will go toward supplying the human machinery with fuel to preserve the temperature equilibrium and give the energy which finds expression in muscular activity.

According to the Atwater bulletin on food composition issued by the United States department of agriculture, the dried date shows the following percentage composition;

Carbohydrates.....	70.6
Protein.....	1.9
Fat.....	2.5
Water.....	13.8
Ash (mineral salts).....	1.2
Refuse (fibre).....	10.0
	<hr/>
	100.0

This analysis may be taken as a fair average for dates. Some fruit will show as high as ninety per cent. carbohydrates, others lower than the percentage given in the analysis. The carbohydrates are made up almost wholly of sugars of the hexose or six carbon series, a small residuum being pectin bodies of the pentose or five carbon series.

The pectin bodies belong to the gums, and lead to the jellying of the fresh cooked juice of the date or of the sap from the plant. The hexose group of carbohydrates, or sugars, are the principal food element, and dates have been classified into two great groups, according as they contain relatively large amounts of cane sugar or invert sugar. As far as is known all dates are originally cane sugar carriers, but some varieties develop in relatively large quantities the ferment invertase, which "inverts" the cane sugar, the invert sugar being a mixture in molecular proportions of levulose and dextrose, fruit sugar and grape sugar respectively. The latter varieties form typical predigested foods, as the molecules of invert sugar can be absorbed directly and stored by the animal economy without any preliminary digestion, the invertase performing the function of a similarly acting ferment in the intestinal tract.

The protein and fat content, though small, is in a readily available form, the protein as a builder and the fat as a fuel. A man who includes two pounds of dates as the bulk of a day's ration will not require much additional protein, the physiological requirement being approximately one gram per kilo of body weight per day. In fact, a pure date dietary meets the requirement of many Arabs in every day activities for long periods at a time, without the addition of any other food.

Lost in the technicalities of the above analysis are the aromatic substances that give the date its peculiar flavor, apart from sweetness due to sugar. These aromatic bodies are rather easily volatilized, and in the treatment of dates for market care must be taken not to drive out the aroma, as the date then loses its seductive flavor.

The chemical composition of the date at that stage of complete maturity known as ripening depends on the activity of various ferments. These ferments are held in colloidal form within the cell protoplasm. When ripening begins they lose their colloidal character and can then pass through the cell surface, diffusing through the substance of the fruit and beginning those changes that result in ripeness. Simultaneously the tannic acid of the date becomes insoluble, and the date loses the puckering taste characterizing the green fruit. Just what these changes are chemically is not known, but experiments have proved that beyond a certain stage of maturity the ripening of the date is not necessarily vitalistic but due to the enzymes or ferments liberated by the cells. In fact, ripening may be initiated naturally by an agonal period preceding the death of the cell. At any rate, at maturity the date is filled with all the potentials and materials for ripening; it can be removed from the tree and very often ripened to better advantage artificially. The "artificial" part of ripening a date simply consists in giving the fruit the best possible environment in which to activate or quicken the work of its enzymes.

When the date accumulates fifty per cent. or more of dry matter it begins to ripen. It grows darker in color, softer, translucent, loses its astringency owing to precipitation of its tannin, becomes

sweet, and develops the peculiar aroma so attractive to the palate. The cane-sugar are sweeter than the invert-sugar dates.

Different dates vary greatly as to their character when allowed to ripen naturally on the tree. The ideal date for transportation and marketing quickly shows a syrupy juice with a sugar concentration that automatically stops ferment action. It is "sugar cured" and is the best keeping date. Others become watery and, lacking this sugar concentration, tend to sour, through the production of organic acids. Still others dry too rapidly, the envelope cracks open and affords breeding places for bacteria, and yeasts and hatcheries for insect eggs. In the artificial ripening of dates all these factors and others are taken into account, and much progress has been made in perfecting processes for producing dates of good keeping qualities. These qualities depend principally on the following factors:

1. The fruit must have a juice sufficiently concentrated to be sugar cured. This protects it from certain ferments which would carry the changes too far and result in souring.

2. The external envelope must be preserved intact, firm, and dry. This prevents stickiness and the entrance of yeasts and bacteria and the deposition of insect eggs.

3. The action of enzymes contained within the dates must be stopped.

4. Any bacteria, yeasts, or insect eggs clinging to the fruit must be killed.

Without going into exhaustive detail as to methods to bring about these desirable features, suffice it to say that this work is almost perfected through

judicious picking at a certain stage of maturity, pasteurization, chemical treatment, and cleanliness in handling.

The principle underlying artificial ripening is, subjecting the date to a process which kills the protoplasm, or so changes it that the enzymes within the cell protoplasm are liberated and mobilized so that their characteristic action can rapidly proceed. Many agencies can bring this about, and among them are heat and moisture, gasoline, nitrous ether, and various acids and alkalies. The essentials of a ripening process are:

1. Efficiency as to rapidity and completeness of action.
2. Preservation of flavor.
3. No poisonous substance must be left in the fruit.
4. Convenience and economy in operation.
5. As dates are hygroscopic they must not be over exposed to moisture, as that favors souring.

The most successful method at present, in Arizona, seems to be a combination of exposure to carbon dioxide gas with proper temperature and moisture, a process resulting in fully ripened, well flavored, and sterile fruit. Clean handling and proper shipping containers complete the method.

In California, at the Indio Experiment Station, carbon dioxide is not found essential to the ripening method employed. Climatic and seasonal differences probably explain the varying results of different methods employed. In Arizona the date grower has to contend with rains at the ripening time, which the California grower has not to face.



PACKING DATES AT BUSREH, ARABIA

Culls are carefully sorted; the best are exported for native consumption and the refuse made into vinegar or alcohol.

PART II.
DATE VARIETIES

VARIETIES

[In the following list of varieties I have given first, in each case, what I consider the correct spelling of the variety name, followed by variations which have been used in print, and the English meaning of the name, when I knew it. The list includes only one-fourth of the varieties which have been grown in the United States, but I believe it lacks none which is of any importance now.]

Amari, Ammary, Ammaree, The Abundant, a common Saharan variety, valued because it is one of the first to bear. It is the earliest North African date in the United States, but its quality here, as in its native home, is mediocre. The fruit is dark and soft. It ripens in August, or (in some parts of Tunisia) in the middle of July. It is rarely seen on the market, as the growers eat it up as rapidly as it ripens, picking it from the bunch as it matures. It ripens unevenly, a whole cluster never maturing at once. The palm is productive; the foliage coarse and heavy, leaves very numerous, rather short stalked, with long, wide leaflets. Stalks and branches of fruit-clusters are orange-colored.

Fruit one and one-fourth to one and one-half inch long, about one-half as wide, generally inversely egg-shaped, square at base, rounded at apex. Color dark brown purple. Flesh one-eighth inch thick, soft and dark-colored, fibrous. Seed two-thirds as long as fruit, two-fifths as wide as long, mars brown in color, blunt at both ends, ventral channel open, germ pore indistinct. (Kearney).

Amhat, The Pure (?), one of the commonest Egyptian varieties; has not yet fruited in the United States. A small date, orange-yellow in color, usually eaten only in the fresh, soft (rutab) condition, except

when grown in Upper Egypt, where it is dried (turning dark brown) and exported in bags made of palm leaves. The flesh is pulpy and syrupy, sometimes mucilaginous; when grown in moist localities it does not keep well. The palm is highly productive but does not flourish near the seacoast; its center is at Badrashín in the province of Gizeh, where it has a sandy soil and is often not inundated. American missionaries in the Fayúm consider it the best date they get.

Amír Hajj, Mirhage, Commander of the Pilgrimage Caravan (so named, it is said, because the owner of the original tree held this important position), an attractive soft date which is confined to the oasis of Mandalí, three days' journey east of Baghdád on the frontier between Persia and Mesopotamia. The variety is rare even in its own home, and is jealously guarded by its owners, wealthy, aristocratic, and fanatical Muslim heretics, who refuse to part with offshoots, so that not even their neighbors and friends in the surrounding region have been able to secure this palm, and several attempts to secure offshoots for importation to America have likewise failed. As many seeds of the variety have been planted in California, it merits description.

The palm is tall and graceful, but delicate, requiring a great deal of cultivation and water; even then it is a shy bearer. It grows in a sandy and alkaline soil. The fruit matures in midseason—probably about October 1st. It is indisputably a good date, but owes its reputation partly to the jealous care with which the owners guard it, and to its attractive appearance and unusual translucence.

It used to be sold occasionally on the Baghdád market but is now never seen there; it is exported only as presents from the people of Mandalí to their friends; in this way it not only reaches Baghdád but Damascus, Bayrút, and Constantinople. The Baghdádís, perhaps from jealousy, are accustomed to depreciate its quality, and intelligent men have even told me the ridiculous story that Amír Hajj is nothing but Khustáwí, the Baghdád favorite, cured by a secret process. A dispassionate observer will decide that the date is of first quality, but that there are several in Mesopotamia which are equally good.

In form, this date is broadly oblong-oval to oblong-ovate, flattened at base, widest at or near center, apex rounded to broadly pointed, base flattened. Size medium large, one and one-quarter to one and three-eighths inch long, seven-eighths to one inch wide. Surface dry or nearly so, roughly undulating, slightly glossy where the thick bluish-gray bloom has been rubbed off; deep, rich orange-brown in color, unusually translucent. Skin firm but rather thin, not easily broken, though tender; loosely folded, the folds rather prominent but only occasionally separating from the flesh; no blisters. Flesh three-eighths inch thick, of caramel consistency, translucent light golden-brown in color; fibrous lining of seed cavity yellowish-cream colored, fibre tender and unnoticeable in the mouth. Seed rather small, three-quarters inch long by one-fourth to three-eighths inch wide, oblong to oblong obovate, blunt at base, slightly tapering at apex; smooth; deep, dull brown in color; ventral channel almost or entirely closed; germ pore at or near center. Flavor very rich and

pleasant, not so sweet as to be cloying nor so strong as to be objectionable. Although the date somewhat resembles Maktúm in appearance the flavor is entirely different.

Amrí or Amirí,* the principal commercial date of Egypt, very largely exported to London from Sharqia, Faqús, Salhíeh, and Abú Kabír; it often appears on the market under the name of "dates from Tel el Kebir." Yellow and syrupy when fresh; dark brown when cured; large; admirable shipping qualities. It is much in demand and the best fruit is packed like confectionery. Has not fruited in the United States, unless an old and unnamed palm near Indio, California, be of this variety. A palm of this name which fruits successfully at Tempe, Arizona, is a dry date.

Anjásí, The Pyriform, a large, brown, soft date from Baghdád, which ripens in early September, and bears rather heavily; the fruit is considered to be of good quality, but the variety is not common. Good when fresh or cured. Has not yet fruited in the United States.

Arishti, see Ríshtí.

Asab'i al Arús, Sba el Aroosa, The Bride's Fingers, a common name for a date among Arabs, because the fingers of a girl on her wedding day are polished and painted until they are works of art. The date of that name in Algeria and Tunisia is an

*Perhaps from Amr, a common name for men. Delchevalerie refers it to the same root but makes it Umri, The Date of Life.

inferior soft date, but a much better one is grown to a limited extent in most parts of Mesopotamia; it is eaten either fresh or cured. The palm, which is a heavy bearer, ripens its fruit late in September. The date is long and slender, light brown in color. Has not yet fruited in this country.

Asharasí, Ascherasi, Tall Growing, the best dry date of Mesopotamia*, and probably as good an example of the type as is to be found in the world. The apical end is usually soft and translucent, which has led some writers to call it semi-dry. It is a great favorite around Baghdád and almost as much so at Busreh, although it is grown in the latter district on a very small scale; and even at Baghdád most of the supply comes from oases toward the Persian frontier. It has been well tested in California and has proved itself well adapted to conditions here. By its soft consistency, freedom from fibre and tannin, and delicate flavor, it commends itself to all interested in dry dates, but unfortunately offshoots are difficult to procure.

In form, the fruit is ovate to oblong ovate, broadest at or close to flattened base, and tapering to the pointed or broadly pointed apex. Sometimes tends toward ovate elliptical, being rather variable in form as well as size. Medium to medium large in size, one and one-eighth to one and three-eighths inch in length, seven-eighths to one and one-quarter inch in breadth. Surface hard, rough, straw-colored

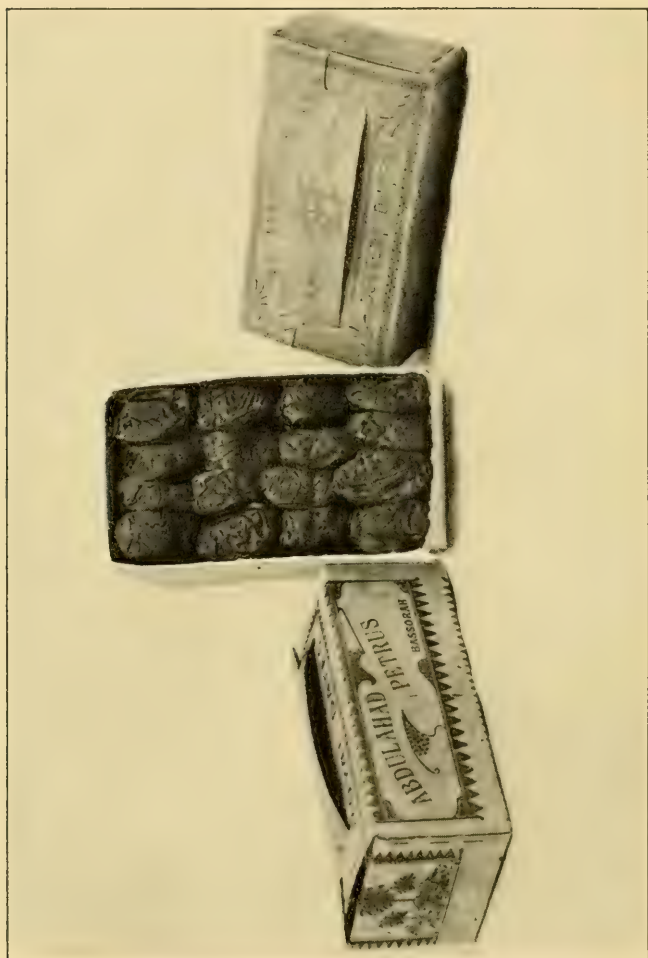
*Ancient writers mention a variety called Al Sarafan, now extinct, which seems to have been much the same as Asharasí. An interesting account of the dates anciently grown around Baghdád, as described by classical writers, is given by Father Anastase Marie in *Loghat el Arab*, No. XI, mai, 1913, p. 509.

around base, translucent brownish amber toward apex; bloom slight, grayish. Skin dry, thin, and tender, breaking frequently, coarsely wrinkled and folded, often separating from the flesh except around base. Flesh at basal end hard, opaque, creamy white; toward tip changing to translucent brownish amber, of solid consistency, one-fourth inch thick. Seed small, oblong-elliptical, blunt or rounded at base and sharply pointed at apex, five-eighths to three-quarters inch long, one-fourth to five-sixteenths inch broad; smooth; light brown; ventral channel almost closed, germ pore nearer base than apex. Flavor rich, sweet, and nutty.

Two allied varieties are distinguished by the Arabs: Asharasí Aswád ("Black") which differs only in color, and Qurret Asharasí, The Coolness (i.e., pleasing freshness) of Asharasí, which has no marked point of difference. There is a widespread superstition in Mesopotamia that these three varieties are sensitive to the odor of melons, and that if one opens or eats a melon under such a palm the dates will all fall to the ground within a few days.

'Ausheh, Aooshet, perhaps correctly 'Aújeh, The Recurving, a rare variety from the Mzab of Algeria which has given good results in the United States.

'Awaydí, "The Little Big One," a rare Busreh variety which many consider the best there, for its mild, delicate flavor as well as its large size. It is also the slowest to come into bearing, offshoots yielding nothing for from eight to fourteen years, according to Arabs. The date ripens about October 1st. and must be well cured, when it packs excellently.



ARAB PACKING "DE LUXE"

Khadrawi is thus packed at Busreh for the best native trade, and sells in the bazars at four cents per pound box.

In its fresh state it is little esteemed. The fruit will keep for a year without deteriorating. A shy bearer.

The date is broadly oblong to oblong ovate, usually regularly oblong but sometimes slightly widest near the broad, obliquely flattened base, thence tapering to the rounded or broadly pointed apex. Size very large, the length being one and three-quarters to two inches, breadth at widest point seven-eighths to one inch. Surface almost smooth, deep golden-brown in color, sometimes tinged with maroon, and overspread with a thick, grayish-blue bloom; marked with a few transverse russet scars toward apex, by which the Arabs distinguish it from similar varieties. Skin thin, tender, very slightly wrinkled, or sometimes folded longitudinally and transversely, but generally adhering to the flesh very closely. Flesh soft and syrupy, three-sixteenths to one-fourth inch in thickness, deep amber colored, tinged with red near the skin; the fibrous lining of the seed cavity rather thick and tough. Seed broadly oblong to oblong-obovate, rounded at base and bluntly rounded at apex, one inch long, three-eighths inch broad, smooth, grayish brown in color, ventral channel open but shallow, germ pore slightly nearer apex than base. Flavor moderately rich, sweet but not cloying.

Two palms in Coachella Valley, brought from Busreh eight years ago, are bearing for the first time this year. The labels are confused but there is reason to believe that they are 'Awaydí.

Azmashí, a rare but much esteemed soft date of the Algerian Zibán, which is never seen on the market, but which many Arabs declare is preferable

to Deglet* Nur. It is said to be about the size of the latter date, slightly lighter in color, and equally translucent. It matures late—well on to November 1. A shy bearer, and the dates are small unless a large proportion of the clusters be removed. May have originated as a seedling of Deglet Núr. Has not yet fruited in the United States.

Badinjání, The Egg-Plant Date, so called from its resemblance to the fruit of *Solanum melongena*. Introduced to the United States only this year. A scarce Baghdád variety, really a dry date, but better when gathered while still soft, and packed in boxes or skins. It is also good when fresh (rutab) and better than the average in its dry form. Season varies widely; in some places it is one of the earliest to ripen, say early August, while in others it comes a month later. Bears well and is highly esteemed.

*Deglet should correctly be transliterated Daqlet when followed by a vowel, or Daqleh when followed by a consonant; the collective plural Daqal is often used by illiterate Arabs of the present day as a singular, Degal. Its general meaning is "weak, emaciated, or thin," and as applied to palms it means, according to one of the best classical lexicographers, "a variety of palm trees, and the dates thereof are bad, although the daqleh may be abundant in fruit; and some have red dates and some have black; the body of the dates being small and the stone large." Another says, "they are the worst of palm trees and their dates the worst of dates." The word refers, in short, to a chance seedling which can not be identified with any known variety, and as such it is regularly used today, and has always been so used, in all Arab communities. But occasionally a seedling designated by this name is found worthy of perpetuation, and then, instead of being given a regular variety name, it is sometimes allowed to keep the word Daqleh in its name, to recall to the Arabs the fact that it is an adventitious variety—such is the case with Deglet Núr and many others. These exceptions do not weaken the general rule that a date described by the Arabs as a degal is of inferior quality, and in most cases it will be found that a variety whose name contains that word is of secondary importance. There is not the slightest authority for saying that degal means a soft date; it is, indeed, more likely to be dry than soft.

Form obovate, narrow and flattened at base, broadly pointed at apex. Very firm in consistency. Size medium large, one and three-eighths to one and one-half inch in length, seven-eighths to one and one-sixteenth inch in breadth. Surface fairly smooth, slightly rough or undulating in parts, dry, light purplish maroon in color, with a satiny sheen; bloom extremely slight. Skin dry, thin but rather tough, coarsely wrinkled transversely over a part of the surface, the rest smooth or undulating; adheres closely. Flesh three-sixteenths to one-fourth inch thick, firm but not brittle, opaque and whitish near base, usually changing to translucent brownish amber toward apex; fibrous lining of seed cavity rather prominent. Seed elliptical, tapering at base and roundly pointed at apex, seven-eighths inch long, three-eighths inch broad, smooth, grayish brown, ventral channel open, germ pore slightly nearer base than apex. Flavor rather rich for a dry date; nutty and pleasant.

Badráhi, Badraihí, Bedraihe, Badurahi, from the oasis of Badrá, (although those of Mandalí are now considered better). The palm flourishes in a sandy soil, and is rarely found at Baghdád. The date is much liked by the Baghdádís, but the whole supply is shipped in. The palm is easy to cultivate, but bears moderately; it has been a decided success in America. Season late September.

Form broadly oblong, tending to oblong-oval and oblong-obovate, broadest between center and apex. Base slightly flattened, apex broadly pointed. Size medium to medium large, one and one-fourth to one and three-fourths inch long, seven-eighths to one and one-eighth inch wide. Surface hard and dry,

smooth to roughly undulating, rarely wrinkled; brownish straw colored, sometimes darker toward apex and lighter toward base. Skin hard, dry, and brittle, adhering closely to flesh and rarely wrinkled or folded. Flesh three-eighths inch thick, light straw colored, very hard and solid, not mealy, free from fibre. Seed oblong-elliptical, slightly tapering at base and pointed at apex, three-fourths inch long, five-sixteenths inch wide, fairly smooth, deep brown in color, ventral channel open, narrow; germ pore slightly nearer apex. Flavor remarkably sweet and delicate, almost honey-like, with very little of the nutty flavor that characterizes Asharasí.

Badrashín, name of a village in Egypt noted as a center of date culture. A variety which was introduced under the probably erroneous name of Okka de Badrashín has proved decidedly valuable in Arizona and is worthy of wide propagation. It is similar in general appearance to Birket al Hajjí but is excessively late in maturing its fruit, which in the Tempe garden frequently hangs on the tree all winter; some of the best dates have been picked in March. It is hardy and a heavy bearer, but in that unfavorable climate the fruits do not mature well unless artificially ripened with carbon dioxid; after such treatment, however, they are an excellent and saleable date, and there is practically no waste. The variety is distinguished by the deep orange color of the stems of its fruit clusters; there will probably be little difficulty in identifying it in its native home, and it can then be introduced to the United States on a large scale.

Bajlání, vulgarly Baglani or Baklani, named after the Bajleh tribe of Arabs, noted as palm growers.

A small but good Baghdád dry date, which closely resembles the favorite Záhídí in appearance and ripens at the same time—that is, it is early. Bears well. Not common. No record of its performance in America yet.

Bárbán, Berban, The Fair Persian*, a name given because of its brilliant red color when fresh. Prized at Baghdád solely for its early maturity (late July); it does not cure or keep well. The date is of medium size; it turns dark brown when fully mature, but never becomes very sweet, or entirely loses its astringency. It is fairly common, however, being a rank grower, and considered the heaviest bearer of the region, with the possible exception of Záhídí, yields of 300 or 350 pounds being recorded. The palm may be distinguished by the great size of its petioles at the base; cross sections of them are used by small boys when learning to swim in the Tigris, because of their lightness as well as size. The fruit is considered rather indigestible; much of it is used, when fresh, for the manufacture of dibs or date syrup, for which the variety is considered well suited.

Barhí, Berhi, originally Bárhí. The Bárh are hot winds which prevail at Busreh during the summer and which are supposed to have a particular influence on the maturity of this date. It disputes with 'Awaydí the first rank at Busreh, although it is scarce; hardly grown at Baghdád. It is delicious at any stage, but unrivaled when fresh. Offshoots are

*The word is itself Persian in origin, and is a contraction of Báhr Bánú, "the beautiful girl." It will be seen, therefore, that my translation above is somewhat free. The variety Tún, now extinct, seems to have been similar to, if not identical with, Bárbán.

slower in coming into bearing than some varieties, but after reaching maturity are prolific. The dates ripen during the latter half of September.

They are broadly ovate, tending to oval, broadest near center or one-third of the distance from base to apex, tapering slightly toward both ends, but chiefly toward apex. Size medium large, the length being one and one-fourth to one and one-half inch, width near base seven-eighths to one and one-fourth inch, more variable in size than most varieties. Surface undulating, translucent amber brown in color, overspread with a bluish-gray bloom which makes it rather dull in appearance; skin medium thin and rather easily broken, not wrinkled, but often separating from the flesh, especially toward the apex of the fruit, in prominent folds and blisters. Flesh firm but very tender, one-fourth inch thick, very syrupy, translucent golden-brown in color. Seed oblong to oblong-ovate, blunt at base, rather sharply pointed at apex, three-fourths inch long, five-sixteenths inch broad, rough near base but becoming smooth at apex, grayish brown, ventral channel broadly open, germ pore nearer apex than base. Flavor mild and extremely delicate, rich yet not heavy or cloying.

The palm is distinguished by a stout trunk. It is successful in the United States, but in the unfavorable climate of Salt River Valley does not ripen evenly.

Bartamoda, Bertamoda, the best soft date of the Sudan, and the only soft date found in commerce there; it has recently been introduced to the United States from Nubia. It brings twice as high a price

as the more popular dry dates which form the bulk of Sudan commerce; probably adapted only to the hottest regions of America.

Bint 'Aisheh (a woman's name), a common date of the Egyptian delta; has not yet fruited in the United States. Large, nearly spherical in form, red when fresh but turns almost black when cured; flesh thick and syrupy, seed small. Usually eaten when fresh, or, if preserved, is put in bags or skins. Late in maturing.

Birket al Hajjī, Hadji, Haggi, The Pilgrim's Pool, name of an oasis near Cairo where the annual caravan to Mecca makes its first stop; also called Birkáwī, from the same root, and Hayání, the name of a village (?); one of the best and earliest Egyptian dates and of great value in the United States. No variety has given such good results in Arizona, and it may be expected to do even better in California.

Outside the oasis from which it takes its name, and which has in all ages been famous for the quality of its dates, this variety is grown commercially in the province of Galiubia, principally in clayey soil, and particularly around the town of Marg*. It is generally considered the earliest of the commercial varieties in Egypt, ripening in July. In Arizona it ripens about October 1, but should do much better than this in favored localities in California.

The palm is one of the most ornamental ever introduced to the United States, with soft and graceful leaves and few spines. It proved notably hardy

*The only place in Palestine where dates are now grown commercially is Gaza (Ghazzeh), and it is this variety which is there grown, particularly at the famous Monastery of Dates.

in the severe freeze of last winter. It is also extraordinarily fecund: in the number of offshoots produced it probably surpasses any other variety of good quality. On one occasion fifty-three offshoots were taken from a palm at Tempe. And, best of all, it seems able to produce offshoots without diminishing its great yields of fruit: 200 or 250 pounds is by no means a remarkable crop for it.

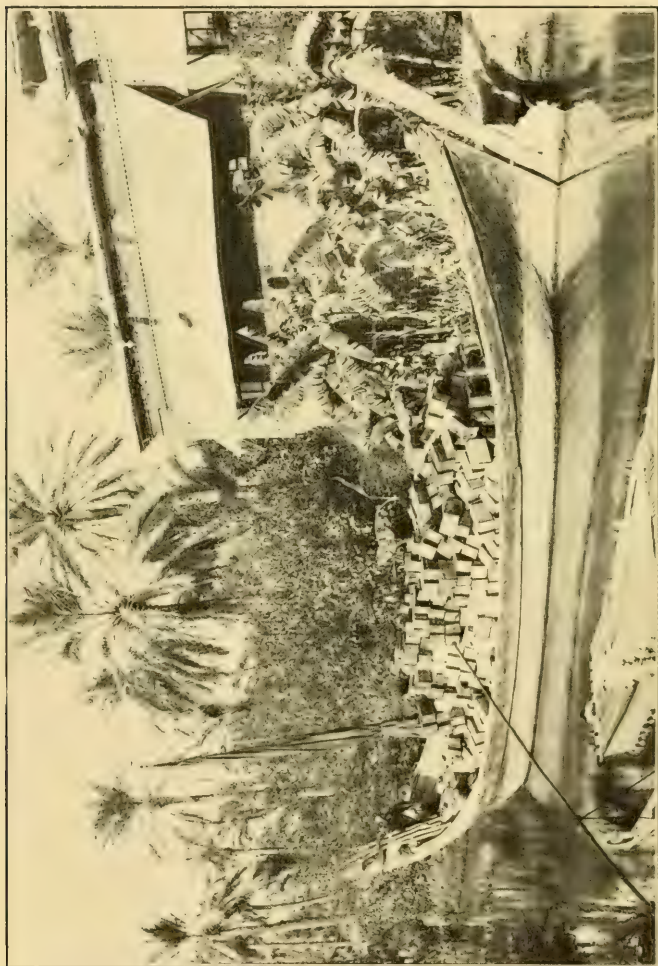
The date is long, and thick in proportion to its length; bright red before fully ripe, and dark brown when cured. It ripens on the bunch with great evenness, hangs steadily until the grower picks it off, and is borne on long stems which allow the crop to be gathered with a minimum of labor: two men have harvested 1000 pounds in a day at Tempe. Because of the facility with which the crop is handled, as well as the large yield, Vinson declares that anyone who grows the variety in Arizona and only makes five cents a pound net profit from the fruit will clear \$200 per acre annually. The dates have never shown any defect in ripening, except in hot, steamy weather, when the ends sometimes crack—but this kind of weather is rarely found in most date-growing districts.

The palm bears at a very early age in Egypt, often two years after the offshoot is planted.* The variety is one that can be unhesitatingly recommended to the American planter.

Brím, Brem, often spelled Brehm by confusion with Ibráhímí, while the original form may have been Brín.† Common at Busreh, where it is eaten

*Delchevalerie, G. Le Dattier. In *Bul. de la Fed. des Soc. Hort. de Belgique*, 2d fasc. Liege, 1871. The author was head gardener to the Khedive.

†This variety seems hopelessly confused. After collating ancient authorities, the learned Carmelite friar Pere Anastase-Marie of



EXPORT DATES AT BUSREH, ARABIA

The fruit, packed in seventy-two pound boxes, is on the canal awaiting shipment by ocean-going steamer direct to New York.

fresh or boiled; rare at Baghdád, where it is much more highly esteemed. It is never boiled at Baghdád; it is never preserved in any other way at Busreh. After its sixth year the offshoot bears heavily, ripening its fruits about September 15.

The following description was made from a boiled specimen at Busreh: form oblong-ovate, widest near the flattened base, thence tapering to the broadly pointed apex; size medium, length one and one-fourth to one and one-half inch, breadth at widest point three-fourths to seven-eighths inch. Surface hard and rough, golden brown to light brown in color, bloom none. Skin thin, dry, hard, profusely wrinkled in all directions but adhering to the flesh very closely. Flesh hard, dry, coarsely granular, one-eighth to three-sixteenths inch thick, golden brown near skin but becoming lighter in color toward the seed. Seed oblong, blunt at base, broadly pointed at apex, seven-eighths inch long, five-sixteenths inch wide, fairly smooth, brownish gray, ventral channel almost closed. Flavor sweet, very slightly astringent.

Bú Narinja or sometimes Qush Bú Narinja, Father of the Orange, because of its color*. A common soft date in the Persian Gulf and inland

Baghdád reached the conclusion that it was originally the same as Burní or Birni (see Loghat el Arab, No. 11, Baghdád, April, 1912.) But even granting this, the two varieties are certainly distinct now, if indeed there be not two or more varieties contained in each name. The lexicographer Abú Hanifah makes the interesting suggestion that this variety is identical with the famous Sayhání, which grows in the Hijaz and particularly at Khaybar, east of Madína, and is known in Algeria as Kasbeh.

*The Persian náránj originally meant flame-colored; hence it has come to mean the fruit of that color, in most modern languages. Cf. Spanish naranja; our own word orange is of the same origin.

Arabia under this name, sometimes corrupted to Qush Bin Aringa; it is often sold boiled, when it passes—in the Masqat market, at least—under the name of Sakkari, sugary. It is said to be the favorite variety on the island of Bahrayn; and it is so like Khaláseh in appearance that attempts are often made to sell it as such. The variety (which has not yet fruited in America) is highly esteemed; it ripens in the latter part of August, and yields heavily. One of the favorite dates for eating rutab, but it also keeps well; as it is soft under Arab handling it is usually sold in bags; it has a very tender, light brown skin, small seed and no fibre; flesh light golden brown in color, caramel consistency but rather sticky. Flavor sweet and delicate. Boiled specimens which I obtained were one and one-fourth inch long, five-eighths inch wide, broadest about base, tapering gradually to rounded apex. Dark chestnut-brown color. Flesh one-eighth inch thick, fairly soft, dark café au lait color, some fibre, cavity large and loose. Seed, seven-eighths inch long, five-sixteenths inch broad. Flavor in boiled form bad.

Búrlús, Bourlos, (name of a village) one of the largest dates of Egypt, grown throughout the delta, particularly around Rosetta. It is soft, oval in form, skin orange-yellow when fresh (in which form it is usually consumed) but later turns dark brown; pulp solid and light in color; flavor slightly astringent. It is the favorite variety for making conserves and sweet pickles. Has not fruited in America.

Burní, Berni, The Sweetmeat Jar (Pers.)*, an

*This is the derivation given me in Masqat; other authorities derive it from a town named Burn, or from the Pers., bir, fruit and

Oman variety which apparently has no relation to the classical Birní* of Arabia and North Africa despite the similarity in name. It is a dry date similar to Naghal and of unique appearance. Fruit one and eleven-sixteenths inch long, eleven-sixteenths inch wide, basal half of almost uniform width, tapering thence to blunt, flattened, sometimes depressed apex. Basal half a dead, yellowish gray, apical end light chestnut brown, the division of colors being distinct. Seed cavity large, and large seed loose in it, with considerable fibre. Flesh thin but more tender than that of the ordinary dry date; keeps indefinitely. Seed one inch long, one-quarter inch wide, usually some fibre adhering to it. Date requires chewing and has a rich, full, but not cloying flavor, with slight trace of bitterness. It is often sold on strings, like necklaces, in the Masqat market, at the rate of thirty for a cent. Ripens midseason, bears moderately. Not a common variety in Samáil. Cannot be considered of top-notch quality, but on account of its great size and double coloring it is decidedly interesting.

Burshí, The Curved Dagger (Hind.), a small, fat, yellow, dry date of Oman, doubtless curved, as its name suggests. It is a common variety, valued because it ripens about June 1. Yield said to be of moderate amount. Has not yet borne in America.

nik, good; or bir, crop and ní, heavy, etc. Consult Pere Anastase, loc. cit. His opinion that this was originally the same as Brim has been mentioned, and Fairchild (B. P. I. Bul. No. 54, p. 23) evidently saw Brim, not Burní of Masqat, which is markedly different. The varieties Brim and Burní are too confused to be separated without an exhaustive investigation.

*Highly prized by Arabs because Muhammad said, "It causeth sickness to depart, and there is no sickness in it." Still used as a diet in smallpox.

Deglet Núr, properly Daqlet al Núr, Date of the Light, or The Translucent Seedling, a variety which originated in the Saharan oasis of Balad al Ahmar 300 years ago and at once assumed the position of uncontested supremacy which had previously been held by Kasbeh or Bú Zakrí.* Another version derives its name from a female saint, Lalla Núreh, who is supposed to have lived at the oasis, where she said her prayers regularly by the side of the road, and repeated the ninety-nine names of God; but as she was too poor to buy a rosary for this purpose, she selected ninety-nine date seeds, on which she told the attributes of the Deity. When she died, passers-by found her body and buried her on the spot; the ninety-nine date seeds were left lying about and, taking root, became palms of this new and superlative variety which, after the owner of the seeds, was called Degleh Núreh, or Núreh's seedling. Such is the Arabic legend, and the moralising relator adds, "Thus did God reward those who had bestowed charity on his servant (Lalla Núreh) by giving them better dates than they had before possessed."† The variety has now become the standard of excellence in Algeria and Tunisia. I estimate, on the basis of government

*See Descr. Gen. de Africa by Luis del Marmol, folio 15. Granada 1573. The variety is still found in Tunisia, where it is esteemed, and in Tafilalet, where it even today ranks as one of the best dates.

†L. Gognalons has recently put forward a new version of the name, for which he alleges the authority of a Tradition: that Muhammad had a favorite wife named Núreh who, one day as she was bathing, found a seedling palm which had grown by the fountain; she called the prophet's attention to it, and he transplanted it and named it in her honor. This legend is too absurd to be worthy of notice. In point of fact, Muhammad never had a wife named Núreh. Gognalons, L. La Legende du Palmier dans l'Afrique du Nord. Bul. Soc. de Geog. et d'Archeol. d'Oran, t.XXXII, fasc. CXXX (1st trim.) an. 35, mars, 1912, p. 115; and also in Revue Africaine, an. 52, No. 285, p. 203. Alger, 2d trim., 1912.

figures of the production, that in the former country there are at least 350,000 palms of that sort; in Tunisia Gallois* calculates that ten per cent of the 2,000,000 palms are Deglet Núrs. Nevertheless, the production can hardly meet the demand for this date from European markets.

It is of medium size, very sweet, with a delicate and particularly mild flavor in which the characteristic taste of the date is lacking, so that it is more like a confection than a fruit. Its defects are a tendency to ferment after it has been kept for some months, and the immense amount of heat needed to mature it properly. In fact, there is perhaps no date in America which needs a more prolonged high temperature, and for this reason its growth will never be profitable except in a few favored regions such as the Salton Basin of California.

Unless carefully handled the date is soft and sticky, but if well cured, or if ripened artificially, its consistency is entirely satisfactory. The Arabs most fear a rain when it is ripening; this spoils the appearance of the dates and makes them unsaleable for fancy trade, so they are pressed tightly into skins, and within a few months begin to ferment, acquiring a pineapple flavor which is much appreciated by the poor nomad who buys them at bargain prices. In America they can be saved, if struck by rain, by quick artificial ripening, which, however, darkens their color and destroys most of the distinctive flavor. Much of the fruit offered for sale in Algerian markets is a disgusting, syrupy mass, but the variety, like many other soft dates, can also be marketed as a dry

*Gallois, Eugene. *L'Olivier et le Palmier en Tunisie*. Bul. Soc. de Geog. Commerciale, t. XXXII, p. 465. Paris, 1910.

date, and is so marketed, particularly in the oasis of El Kantara where, the summer being too short to mature it properly, the fruit has a crisp texture and a little astringency. In this condition it is little relished by Europeans, although the Kantarans, with a loyal desire to conceal the deficiencies of their climate, declare they would not eat the mushy Deglet Núrs which the people of other oases enjoy.

The variety matures in October or early in November. In Coachella Valley it tends to dry up or mummify on the palm at the very time it should be filling with syrup; this may be prevented by daily irrigations at the ripening period. The palm demands plenty of care,* in the shape of irrigation, fertilization and cultivation, but, given this, shows less tendency than most varieties to rest every other year. The yield averages 100 pounds or more in California. Offshoots are hardy, easily shipped and rooted. The Arabs have the idea that the wood of this variety is more resistant to rot, when placed in the ground, than any other.

The tree, like those of most particularly choice dates, is notably graceful with its slender trunk, light and delicate foliage, which is of a yellowish green, and its bright yellow fruit stalks, which hang down far below the crown of foliage. Its spines are slender and weak.

The fruit is one and one-third to two inches long and about one-half as wide, widest near middle, sloping slightly to flattened or depressed base and more abruptly to bluntly pointed apex. Color

*Students of environment will be interested in the statement that in the Tuat oases of the remote Sahara, Deglet Núr is "degenerate and despised." Martin, A. G. P. *Oasis Sahariennes*, p. 290 f. Paris, 1908.

orange rufous before maturity, maroon when ripe; its skin ochraceous colored where loose, shiny. Flesh one-fourth inch thick, deep golden brown, soft and melting, conspicuously translucent, so that the outline of the seed can be seen if a date is held to the light. Seed a little more than one-half as long as the fruit, pointed at apex and base, light chestnut in color, ventral channel shallow and partly closed, germ pore in center.

Dubaíni, Deboeni, Deboweni, from the oasis of Dubaí, near Baghdád; a date resembling Khustáwí, but larger. Has not yet been tested in California. The palm bears heavily, midseason, and the fruit keeps well. It is rarely eaten fresh, but is packed in skins for future use. Under American handling it should prove an excellent date for packing and shipping in attractive form.

Form oblong-oval to oblong-ovate, widest at center or slightly below, thence tapering to the flattened base and the rounded to broadly pointed apex. Size medium, length one and one-fourth to one and one-half inch, breadth seven-eighths inch. Surface irregularly rough, translucent, clear, light reddish brown in color, bloom unnoticeable. Skin thin but moderately tough, firm, not wrinkled but sometimes folded or blistered and separating from the flesh, although in the main it adheres closely. Flesh one-eighth to three-sixteenths inch thick, translucent golden brown in color, firm but tender, syrupy, slightly fibrous around seed. Seed broadly oblong rounded at both ends, plump, three-fourths inch long, five-sixteenths inch broad, smooth, cinnamon brown, ventral channel narrow, germ pore slightly

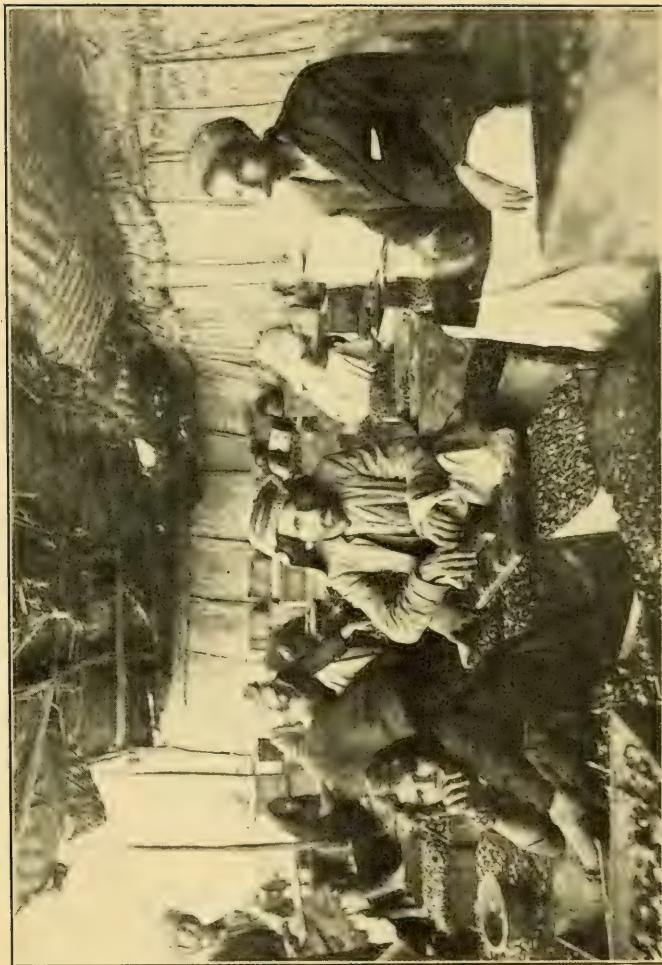
nearer apex than base. Flavor mild but rich and syrupy, very similar to that of Khustáwí.

El Kseba, see Kasbeh.

Fardh, Fard, The Separated, because of the way the dates are arranged on the bunch, according to modern Omani etymologists, but the ancients, who are much more entitled to credit, spell it differently, in a way that probably means "The Apportioned." This is the great commercial staple of Oman, and is sold in large quantities on the American market, where its perfect form, due to its firmness, makes it bring a relatively high price in spite of its second-rate quality.

The variety is confined to Samáil Valley and its continuation, Wádí Amán, in eastern Arabia, sixty miles from the coast, and it so preponderates that two-thirds of the half million palms are said to be Fardhs. The growers declare that it will not flourish in any other locality, and it certainly does not flourish on the coast, probably because of the difference in climatic conditions; but in its own home it is not considered a delicate variety. Offshoots grow readily if given care, and usually begin to bear in three years, reaching their maximum yield three or four years later; the number of bunches carried by a palm is large, but they are not individually heavy, and 180 pounds is considered a big yield for one palm.

When the fruit begins to ripen, about September 1, the whole of Oman is affected, and the only activity of the year takes place on a large scale. The production is now about as large as is profitable, and if the year is unusually favorable it is difficult to



DATE PACKERS AT BUSREH, ARABIA

A seventy-two pound box is the standard for export, and the dates must be pressed tightly to prevent them from drying out on their long journey.

dispose of the crop, for which the growers receive little more than one cent a pound. In an ordinary year they get about a cent and a half. Usually buyers take the crop while it is still on the tree, paying the owner \$1.50 to \$2.00 for the crop of a good tree. Because of its remarkable shipping and keeping qualities, the date is exported all over the Persian Gulf region, to Southern Arabia, and in large quantities to East Africa; but the United States is, as it has been for many years, one of the most profitable customers. Much of the date export trade is carried on by chartered steamers which make the trip to New York direct. Exports to New York in 1911 were 3,882,008.5 pounds valued at \$154,662.42, according to consular invoice; for preceding years the value of the annual shipment to New York was as follows:

1910.....	\$ 94,082
1909.....	40,771
1908.....	59,036
1907.....	105,011
1906.....	131,058

Probably this variability in the exports is due more to fluctuation in the amount of the crop than to variation of the American demand, which is fairly steady, because the Fardh date is the only one imported by the United States which can be bought in fairly presentable condition. Its tough, firm flesh allows it to come on the table intact, while the superior Haláwí and Khadhráwí of Busreh have been so squeezed out of shape by the heavy feet of the Arab packer that they do not look presentable, no matter how good their flavor may be.

Offshoots of the Fardh palm are invariably small in size, and those used by native growers rarely weigh more than five pounds. Such an offshoot is good to plant as soon as taken from the tree, but of course does not stand shipment as well as a larger one would, and this may be one of the reasons why the variety has not been established far from its original home. Several attempts have been unsuccessfully made to start it in the United States; during the present year, however, it was introduced on a large enough scale to give every chance of success. The variety certainly receives a great deal of care from its owners, and probably needs the same treatment in the United States, irrigation, cultivation and fertilization not being stinted. While no fruit has yet been produced from offshoot Fardhs in this country, seedlings have given good results in Arizona, the product in more than one case being better than that which is imported; and there is a particularly good reason to expect satisfactory results from seedlings of this variety, since it is so much cultivated in the few places where it is grown that there is every chance that the male by which the tree was pollinated was also a Fardh, of seedling origin. Because of its early maturity and shipping qualities the variety will be valuable to the United States; yet it cannot be considered as a date of high quality, if flavor alone be considered, and it can never compete with such varieties as Maktúm or Khadhráwí, far less Khaláseh or Deglet Núr.

The berry may be technically described as follows: Very dark brown, one and one-fourth inch long, three-quarters inch wide, broadest near

middle but tapering little until its blunt apex. Flesh one-eighth to one-fourth inch thick, sticky but of firm consistency, russet brown in color. Skin fairly thin and tender. Seed small, five-eighths inch long, three-eighths wide, tight in cavity; little fibre. Flavor sweet with rather strong after-taste. A small date, but if packed properly has dry skin and perfect shape.

Fursí, Fárisí, vulgarly pronounced Firsí, The Persian, a little-known Busreh variety which was introduced to the United States this year. It is eaten either fresh or cured. The dates ripen early in October, and the yield of the palm is fairly large. Packing and keeping qualities excellent.

Form oblong-ovate, widest close to the flattened base, thence tapering to the sharply pointed apex. Size large, length being one and one-half to one and three-fourths inch, breadth at widest point three-fourths to seven-eighths inch. Surface slightly irregular, somewhat glossy, translucent, deep reddish brown to purplish maroon in color, the bloom very slight. Skin thin but fairly tough, indiscriminately wrinkled but not deeply so, occasionally separating from the flesh in folds. Flesh soft and tender, one-fourth inch thick, translucent amber to reddish amber in color. Seed oblong, rounded at both ends, three-fourths inch in length, five-sixteenths in breadth, smooth, cinnamon brown in color, ventral channel almost closed. Flavor rich and sweet; decidedly pleasant.

Ghars, Rhars, R'ars, The Vigorous Grower, one of the commonest of North Africa soft dates and

much esteemed because of its early maturity, heavy yield, resistance to alkali*, tolerance of neglect, and the easy digestibility of its fruit, even when eaten in large quantities steadily. In the United States it has proved a shy bearer, and in moist climates such as that of the Salt River Valley, Arizona, its fruit matures unevenly, and ferments before it can be handled. In California, and particularly if pollinated by *Phoenix canariensis*, the fruit is easy to handle and will always be valuable because of its large size and earliness. It seems to do best on a sandy soil.

In California the fruit ripens at the middle of August, but in its native home sometimes two weeks earlier than this. The tree shows a tendency to bear a good crop only every other year, but this is largely overcome by giving it good treatment. The root system is deep, in comparison with the shallower root system of Deglet Núr. Offshoots are considered hardy by the Algerians, although other varieties have been found easier to propagate in the United States.

As is indicated by its name, the tree is sturdy and vigorous, the trunk stout, and the foliage luxuriant, the numerous long leaves being crowded with long, broad leaflets. Stalks and branches of fruit-clusters are bright orange.

The fruit itself is one and one-half to two inches or more in length, and two-fifths to nearly one-half as wide, oblong or inversely egg-shaped, bay colored, but sometimes ochraceous when the shiny skin has lifted in big blisters. In general, the skin adheres closely to the flesh, which is three-eighths inch thick,

*In Algeria no variety tolerates more alkali unless it be the inferior dry date, Degla Baydhá.

soft and syrupy when fresh, granular after it has been kept a year or more; slightly translucent. Seed three-fourths to one inch long, rounded at each end, cinnamon to chestnut in color, ventral channel deep, sometimes closed near middle, germ pore in center. Flavor sweet and very rich.

When matured in the way usual in California, the fruit is delicious if fresh, but the syrup drips out of it so that in a few weeks it becomes dry and tasteless. The Algerian overcomes this by pressing the fruit tightly in skins as soon as it is picked. In California the fruit is firm and does not drip if it is pollinated by the so-called Canary Island date palm; otherwise it should be carefully ripened artificially. Irrigation should be stopped when the dates begin to soften on the tree. In Arizona it is considered that the best results are secured when the fruit is artificially matured with carbon dioxid. Because of the short stem of its fruit cluster the dates are difficult to pick; the green fruit can be detached more easily than that which is fully ripe. The variety proved rather sensitive to cold last winter.

Ghazí, Rhazi, R'azi, The Warrior (i.e., a participant in a raiding foray of the nomads), one of the earliest of Algerian varieties, usually eaten when fresh and soft—the rutab stage. The palm is of middle size, and never bears very heavily; in the Zíbán the fruit ripens in September. The date is described as of medium size, long in proportion to its breadth, yellowish red when fresh, later turning to a golden brown; normally soft, but if left on the palm it will become almost dry, and in that condition keeps well. Sub-varieties distinguished by the Arabs

are Laún al Ghazí and Núwá al Ghazí, both doubtless of seedling origin; the former is considered of superior quality and the latter earlier in ripening.

Gundila, Gondila, Gondela, a dry date from Nubia and the Sudan, which has been introduced to the United States but has not yet fruited. Large size, yellowish brown color. Season September. Ordinarily grows in sand. With Barakáwí, another dry variety, this makes up practically the whole commerce in dates in the Sudan. An ardab (320 pounds) of the latter sells for \$4 to \$5 while the same quantity of Gundila brings from \$5 to \$6.

Haláwí, The Sweet, the great commercial date of Mesopotamia and probably the most important commercial date of the world in point of quantity sold. It ripens early, bears heavily, packs well, and keeps well, but the Arabs themselves do not care for it as a diet, because they consider it not only cloying but rather indigestible. It is a favorite with the American consumer, however, largely on account of its light and attractive color, and as it has been proved to succeed excellently in America it will probably be planted here on a large scale. In Busreh the variety ripens during the first two weeks of September.

Form slender oblong to oblong-ovate, tapering almost unnoticeably from the broad, flattened base to the blunt or broadly pointed apex. Size medium large, the length being one and one-fourth to one and three-fourths inch, width near base three-fourths to thirteen-sixteenths inch. Surface slightly rough, translucent bright golden brown in color, the bluish-

gray bloom almost unnoticeable. Skin almost tough but rather thin, coarsely wrinkled longitudinally, sometimes separating from the flesh in longitudinal folds. Flesh very firm, one-eighth to three-sixteenths inch thick, translucent golden amber in color, syrupy and tender. Seed slender oblong, sometimes slightly curved dorso-ventrally, blunt at base, blunt to broadly pointed at apex, seven-eighths inch in length, one-fourth inch in breadth, grayish-brown in color, smooth, ventral channel broadly open. Flavor extremely sweet and honey-like, but not rich.

In the constantly saturated adobe soil of Tempe, Arizona, Haláwí has produced fruit much superior to that imported annually for the American market. The dates are sufficiently firm to pack in small boxes without losing their form, and present an attractive contrast to the compact mass which is usually sold in the groceries. They are rich in sugar and possess the flavor to which the buying public is accustomed; therefore they will always be marketable to advantage. The variety does fully as well in California as in Arizona, ripening in September, and is certain always to have an important place in the commercial production of the United States.

Haláwí Makkáwí, The Sweet Date of Mecca. This variety is known at Baghdád and at Hilleh (where it is most common) simply as Haláwí, but it is entirely distinct from the better-known Busreh variety of that name, and I have added the epithet Makkáwí, to avoid confusion. As the epithet indicates, this variety was brought to Baghdád at some time in the past by pilgrims returning from Mecca, and it is now fairly common, although the

fruit rarely appears in the markets. It seems to be a decidedly desirable sort, as it is one of the earliest to ripen (August, sometimes late July), and bears heavily. The date in many respects resembles the Haláwí of commerce, but I believe it will prove even more valuable to California.

It is probably identical with the variety Haláweh mentioned by Faqír Amin al Madaní, who, in discussing the varieties of dates which should be planted, says, "The most desirable is Haláweh, because the palm cannot be equalled for its beauty and nobility, which are admired by all, so that it attracts people from outside regions like Qasím, and strangers when they learn of the palm and its value carry it away and spread it." Strangely enough, no other author mentions a variety at Madína under this name; probably it is the modern spelling and pronunciation of the famous variety Hilwa.* As to the name, the testimony of Faqír Amin can hardly be disregarded, since he is a resident of the city in question. The Baghdádís, familiar with the Busreh date Haláwí, probably changed the Madína name Halaweh without realizing it, to make it like the form to which they were accustomed.

*Held in high repute because of a legend that Muhammad planted a seed of it which grew to full height and produced fruit within a few hours, before the eyes of his companions. A variety Halaya is also mentioned, but it is very small and does not answer the description here. As there is little water or cultivation around Mecca, most of the dates there have been brought from Madína. The curious will find a list of 115 varieties from this sacred city given by G. Fluegel in *Ztschft. d. Deutsch. Morg. Ges.*, Band XVI, p. 686, Leipzig, 1862, from MS. of a pilgrimage by Shaykh Abdu-l Ghaní Ismaíl al Nabulúsí, who had his information from Fath al Dín al Zarándí al Madaní. The root *hlw* ("sweet") is perhaps more commonly used than any other in forming the names of Arab date varieties, and no region is without several variations on it.



HARVESTING DATES

Going after the crop of an unusually tall palm at Elche, Spain.

In form the fruit is slender oblong, slightly wider toward the flattened base than toward the broadly pointed apex; size medium large, length one and one-half to one and three-fourths inch, breadth three-fourths inch. Surface rather smooth, glossy, bright golden brown in color and so translucent that the outline of the seed can be seen; bloom almost none. Skin rather thin, tender, adhering closely to the flesh except for occasional folds. Flesh soft and delicate in texture, three-sixteenths to one-fourth inch thick, translucent golden brown in color with almost no fibre around the seed. Seed slender oblong, rounded at base, pointed at apex, fifteen-sixteenths inch long, five-sixteenths inch broad, smooth, cinnamon brown in color, the ventral channel open, germ pore slightly nearer base than apex. Flavor mild, not as sweet as Busreh Haláwí, very pleasant but not rich.

Halwa, Heloua, The Sweet, a small but good Algerian dry date, the palm of which is considered by Dr. L. Trabut of Algiers to be the most ornamental of any in the Sahara. It is tall but slender, the leaves recurving and graceful, the color strictly glaucous. The trunk presents a smoother appearance than that of most varieties, and the wood is declared by natives to be particularly resistant to rot. The fruit is supposed to have an aphrodisiacal quality, and cakes made from it are often presented to a bride and groom by their neighbors, as part of the wedding feast. The variety bears rather heavily, ripening its fruit early in October.

The date is one and three-eighths inch long, five-eighths inch wide, broadest near center or a little below, tapering very slightly to broadly rounded

apex and flattened or depressed base. The thin, tender, and shiny skin adheres closely to the flesh but is wrinkled indiscriminately. Color tawny olive to golden brown, sometimes with ochraceous areas. Flesh one-eighth inch thick, firm but tender, often more like a soft than a dry date. Seed seven-eighths inch long, one-fourth broad, nearly uniform in width, rounded at both ends, usually with well-marked, wing-like ridges on the sides; ashy gray, neutral or otter brown in color, sometimes with a purplish tinge; ventral channel broad and moderately deep, usually open but sometimes closed in a small part of its area, germ pore in center. Flavor sweet, wholesome and agreeable.

A variety brought from Tunisia by Kearney under the name of Halwa Baydhá (Halooa Bayda) is also growing in the United States, and seems to be little different from the one described above. He describes it as follows:

Fruit one and one-third to one and one-half inch long, about one-half wide, elliptical in outline, not conspicuously narrowed at apex, widest near middle; dull purplish bay when ripe; the flesh one to one and one-half lines thick, becoming very firm and dry; seed about seven-tenths as long as fruit and one-third to two-fifths as wide as long, ventral channel open. Branches of fruit clusters pale orange. Flavor simple, wholesome, and not excessively sweet; season October 10.

Finally, natives of the Zibán distinguish a sub-variety, Laún ("the color of") al Halwa, which is slightly smaller—perhaps a seedling Halwa in origin.

Hamraya, Hamraia, The Red, one of the commonest names for a date variety among Arabs, and several have been introduced to California under that designation. Hamraya of the Zibán, Algeria, is an attractive soft or dry date, fairly late in bearing but yields well. The natives have the idea that the stored dates are particularly likely to be attacked by worms, and that the tree is more subject than any other to the ravages of the *Parlatoria* scale, (*Parlatoria blanchardi*). The fruit may be described as follows:

One and five-eighths inch long, three-fourths inch wide; usually broadest about middle, tapering very little to broadly rounded or flattened apex and flattened or depressed base. Color dark purplish maroon overspread by a faint bluish-gray bloom; but when well dried the thick, tough skin separates from the flesh and becomes fawn colored, or dark Isabella brown. Calyx persistent and dates remain attached to cluster indefinitely. When fresh and soft (rutab) the dates are a beautiful, bright red. Flesh one-eighth inch thick, deep golden brown, firm but not dry or hard. Seed one inch long, one-fourth wide, uniform throughout, of hazel color, base rounded, apex broadly pointed, ventral channel broad and partly closed, germ pore in center. Flavor pronounced, moderately sweet, not cloying.

The Tunisian Hamraya is a dry date, which has not given particularly good results in Arizona. Kearney describes it under the name of Hamrá,* as follows:

*He correctly points out that this is the proper name of the date, while the name Hamraya designates rather the palm which bears a Hamrá date. In practice, the distinction is very rarely made among Arabs, however. Hamrá is the feminine form of the

Fruit one and one-half to two inches long, about one-half as wide, egg-shaped, tapering from near the base to rounded apex; bright purplish maroon when ripe, the colors very handsome. Flesh one to three lines thick, becoming quite firm, the dark-colored outer zone thicker than the white, central portion; seed two-thirds to four-fifths as long as the fruit, generally about two-fifths as wide as long, sometimes with strongly developed wing-like ridges on sides, ventral channel generally open, germ pore generally near middle but sometimes almost at base; flavor mediocre. Branches of fruit clusters cadmium orange. Season about November 1. Not much esteemed by natives; said to keep very well.

A date of the same name, brought from the Mزاب, has done well in the United States, although its keeping qualities are none too good. It is softer than the preceding, and a little larger; apparently there is not much difference between it and the Zibán Hamraya.

All three varieties seem related, and probably several minor varieties of similar names* in Algeria are also related to them. While not of first quality, they will always have a certain amount of popularity because of their coloring.

Hasan Efendí, a man's name, probably that of owner of the palm; a rare and commercially unadjective; the masculine Ahmar is often found in conjunction with date variety names.

*e. g., the Hamraya of Al Arús (The Bridegroom), which is sometimes called merely Hamraya, and from its description is about like that from the Zibán; Hamrá Misábeh, The Juicy Red, "a small date with large seed; red, later turning black"; Hamrá Bishrí, variously described as a soft or dry date; Ahmar bú Amar, etc.

important Baghdád date, somewhat similar to Maktúm. It bore at Indio, California, for the first time this year. Fairly early.

Hasáwí, "From Hasa," an uncommon date at Busreh, but much prized. As to its history I know nothing, but its name and general appearance lead me to think it might be a degenerate form of the Khalásch of Hasa, or even a seedling of that variety. The fruit is described as bearing a close resemblance to Haláwí, ripening among the earliest (in the first part of September), good to eat at any stage, and keeping well when packed. The annual yield of a palm is large, but does not begin so early as Haláwí or Khadhráwí. New to America.

Hayání, see Birket al Hajjí.

Hilálí, Hellali, Moonbeams, a soft date grown in the Persian Gulf plantations, and noteworthy as the latest of the region. It is fairly common in Oman and at Busreh, and provides fresh (rutab) dates up to December. In this condition it is the most delicious I have ever tasted. Has been successful in the United States, but will never be desirable for planting on a large scale because of its tardy maturity. In the Persian Gulf region this date is sometimes boiled for preservation; it does not cure well naturally. Fruit one and one-fourth inch long, one inch wide, broadest just below apex, which is very broad and blunt. Color golden yellow shading to straw at the base. Flesh soft and delicate, melting, golden yellow in color; thick. Seed small, slight amount of fibre. A shy bearer.

Hurra, Horra, Harra, Herra, Hourra, The Noble (i.e., well-born), a large and attractive dry date from Algeria and Tunisia, which has given good results in the United States. In some parts of Tunisia where Deglet Núr is not grown, Hurra is considered the finest date, and many French residents prefer it to the softer and sweeter dessert date. The palm, which ripens its fruits in October, is resistant to alkali and seems to thrive without a great deal of care.

The date is two inches long, one-half as wide, ovate, narrowed from the base to the rounded apex, rather dull purplish maroon in color, with pronounced bloom: (in Algeria it is lighter in color and correspondingly more attractive in appearance). Flesh three-sixteenths inch thick, white central zone much thicker than dark outer portion; firm, becoming dry but never hard or brittle. Seed irregular in size, averaging one inch long and two-fifths as wide, ventral channel closed, germ pore above middle, sometimes near apex. Flavor rich and nutty. (Kearney.)

Huwayzí, Hwezi, named after town of Huwayzeh on coast of Persia, famous since antiquity for its dates. The name is often corrupted to Hevezi, and frequently confounded with 'Awaydí. A choice Busreh soft date which is usually eaten fresh; the Arabs say it is inferior when cured, but this statement is hardly justified. A fairly long, slender date, more or less similar to Haláwí both in shape and color, which is light brown. Ripens the last week of September. The palm bears well from an early age, but is not common. Flavor delicate and pleasant.

The fruit will keep for five or six months in good condition; experimental shipments to New York have been successful.

Ibrahímí, Abraham's Date, a variety so much confused with Brím and Sayyid Ibráhím that it is difficult to get a full description of it at Baghdád, where it is rather rare. It is one of the earliest dates of the region, ripening late in July if the season is favorable. It is large and fat, short in proportion to its breadth; its color when fresh is sorrel, but becomes darker when cured. The palm is said to yield well, and the fresh dates to be good, but if allowed to remain on the tree they take on a rather unpleasant flavor. For this reason it is not often packed, although it is not too soft to keep well.

Ibrahímí, vulgarly Ibrimi, Abraham's Date, one of the largest and most famous of Nubian dates, sometimes reaching a length of three and one-half inches, according to Schweinfurth. It is a common variety, growing in sandy soil. In form it is usually slightly curved, and tapering; almost cylindrical. Can be eaten when soft and fresh, when its color is yellowish-red; later the flesh, which is thick, becomes firm and almost dry, sweet and delicate in flavor; the base of the fruit turns chestnut in color while the apex usually remains red. The seed is very dark brown, and small. The flavor is sometimes compared to that of a carob (*Ceratonia siliqua*). Season, September.

One of the centers of culture of this variety is the town of Sukkut, where an improved type is supposed to be found; hence it is often called Sukkutí, or, vulgarly, Scotty.

Specimens in the United States are still too young to have borne fruit.

Itima, see Yatímeh.

Kanta, Kenta, The Vigorous, a highly prized dry date both in North Africa and the United States. It is of medium size, attractive in color, of good flavor, bears heavily, keeps remarkably well, and ripens comparatively early.

Kearney was told that it frequently bore 330 pounds of fruit, and heard of one tree that was said to have borne 770 pounds, and others 200 years old that bore 265 pounds of fruit annually. The tall, stout palm is characterized by broad leaves with numerous long, rather narrow leaflets. The long leafstalks are spiny only near the base. Light orange stalks of fruit-clusters are stout and horizontal or ascending, and so short that with the bunches they do not equal the leafstalks. The clusters themselves are short, thick and densely crowded with fruit. The palm seems to be resistant to alkali if it is on well-drained soil.

The fruit keeps even better than most dry dates, never losing its shape or becoming hard and brittle. Its season is early October.

The date is one and one-third to one and two-thirds inch long, about one-half as wide, narrowed from the middle or above it to the broad apex, dull bay colored when ripe, the skin rufous or hazel colored, smooth, much loosened in large blisters. Flesh one-eighth to three-sixteenths inch thick, dry but not hard. Seed somewhat more than one-half as long as the fruit, one-third to two-fifths as wide as it is long,



HOW THEY PACK DATES AT BUSREH, ARABIA

For export the fruit is shipped in seventy-two pound boxes. The final act of the packer is to jump on top of the fruit in order to press it down more firmly.

rounded at both ends, Isabella brown in color, ventral channel narrow, open, germ pore above the middle. Flavor pleasantly sweet, wholesome, nutty. (Kearney.)

Kasbeh, Kesba, Kessebi, El' Kseba, The Profitable, a widespread variety in Algeria and Tunisia, which goes back to the beginnings of the scientific date industry in that region,* and before the origin of Deglet Núr held the place which that variety now holds as the undisputed leader. This position was due not only to its intrinsic merits but to the fact that it is one of the famous dates of Madína—the Sayhání—and is connected in a most honorable way with the prophet himself. It is related that Muhammad happened to pass under it, holding the hand of his son-in-law 'Alí, whereupon the palm cried, "This is Muhammad, the Prince of Prophets and this is 'Alí, Prince of the Pious and the Progenitor of the Immaculate Imams." Hence its name, "The Crier,"† and the veneration in which it has always been held, so that it has been spread throughout the Arabic world and is held in esteem wherever it grows.

*Arabs accept two theories as to the origin of the date plantations of Northern Africa: that they are the result of palms brought back by the first pilgrims from that region who visited Mecca and Madína; and that they were introduced by "The Lord of the Two Horns," a semi-mythical personage who in this case is perhaps Alexander Severus. Both these ideas are romance, for the date was probably established here long before the Christian era. See Pliny, in loc.

†It is not the only variety which was moved to utterance by the presence of Muhammad. Al Wahshí bent its head and said, "Peace be upon you," when it saw the prophet once eating its fruit; while a palm of unknown variety, by the trunk of which he used to preach, gave a loud groan when he left it in favor of a regularly-made pulpit. Muhammad thereupon went to it and embraced it, saying to his companions, "If I had not embraced it, it would have continued groaning until the day of resurrection." Ibn Batútah, ed. Paris, 1853, vol. I, p. 275.

Al Bakrí says,* in the eleventh century, "One finds at Biskra all varieties of dates: that which is called Al Kasbeh, and which is identical with Sayhání, surpasses all the others, to the extent that it has a proverbial reputation;" and even up to the present century this variety has always been specified in making a charm to cure malaria. Readers who live in mosquito-infested regions may be glad to possess the secret: you take three date seeds of this variety, write on the first Karún, on the second Arún and on the third Harún;† throw one of them into a fire each day at the time when the chill is due, and by the third day you will be entirely cured, if it be the will of God.

The date is of medium size, and soft, but is sometimes allowed to dry on the tree, when it becomes a typical dry date, of good consistency. The Arabs of Algeria regularly ripen it by a slow artificial process, picking it about September 15 and putting it in a bag; in ten days it is ripe, juicy, and yellow in color. If left on the palm, it ripens about October 1. As the flavor is good and the keeping and shipping qualities leave nothing to be desired, this date has become justly valued in the United States.

The foliage is characterized by having few spines, and these slender and weak. The branches of the fruit-clusters are deep orange.

The fruit itself is one and three-quarters inch long, three-quarters inch broad, widest near base, thence tapering slightly to bluntly pointed apex and flattened or depressed base. Golden brown to

*Al Bakrí, *Descr. of No. Africa*, tr. by M. de Slane. Paris, 1869, p. 126. The book was finished in 1068 A. D.

†These are doubtless the names of demons whom it is hoped to destroy.

chestnut in color. Skin thin but fairly tough, usually adhering closely to flesh but sometimes loosely wrinkled in large, longitudinal folds. Flesh three-sixteenths inch thick, soft in fresh specimens, firm when they are well cured, but never hard or dry. Seed large, fifteen-sixteenths inch long, three-eighths broad, cinnamon brown to chamois in color, ventral channel open and deep, germ pore slightly nearer base than apex. Flavor sweet, slightly heavy but not cloying.

Few Algerian dates have more sub-varieties than this—in California alone two palms have been grown under the name, one of them producing a soft and the other a dry date. In Algeria there are a dry date known as “Medjel Kesseba” and a large and excellent but very rare soft date known as the Kasbeh of Bin Abdu-l Azíz, which is longer, darker in color (looking much like Yatímeh) and softer than Kasbeh. The flesh is thicker and seed smaller, darker, and more tapering, the germ pore nearer apex than base. The skin wrinkles more profusely in longitudinal folds; the flavor is milder. Despite its name, I do not think this excellent date has any relationship to Kasbeh.

There is, however, another date which has been introduced to California, which apparently has a genuine relationship—Nakhleh Zíáneh (q.v.) which in some districts is called Laún al Kasbeh, i.e., the Color of Kasbeh, a word which suggests that it originated as a seedling of the more famous variety.

Finally, there is an excellent little dry date of Algeria, which has also been introduced to California but has not yet fruited, that is called Kasbet Amíreh, i.e., the Kasbeh of a woman named Amíreh. This is

slightly smaller than Kasbeh, and is said to be less affected by rain at the time of ripening than any other variety of the region.

Khadhráwí, Khadrawi, Khudrawee, The Verdant.* Next to Haláwí, the most important of the Busreh dates, and the staple diet of wealthy Arabs, who rarely offer any other kind to visitors. It has proved itself better adapted to conditions in California and Arizona than any other Persian Gulf variety yet tested, and this fact and its excellent qualities insure it a permanent place in plantations here. It has the advantage of bearing fruit earlier than any other offshoot at Busreh; sometimes in the second year after planting and usually in the third, if given good care. It ripens its dates only a few days later than Haláwí (say September 15), and bears a heavy crop. Its mild, satisfying flavor, which never cloy the palate, and its "coldness," cause its use in great quantities even at Baghdád, where it brings as high a price as Khustáwí and many other dessert dates. It is grown only to slight extent at Baghdád, but is rather more common at Mandalí and Diyála, where the growers consider it is a little larger in size than the Busreh product. The palm is vigorous and healthy; conspicuous for the length of its spines (sometimes six inches), which make a wide angle with the petiole.

As seen at Busreh, the fruit is oblong to oblong-elliptical, widest at or near center, thence tapering slightly to the broad, somewhat flattened base, and

*The root means simply green, and doubtless refers to the foliage of the palm. Classical lexicographers pretend the variety was so named because the fruit falls while still green, but as that is not the fact, their etymology must be considered fanciful.

the rounded to broadly pointed apex. Size medium large, the length being one and one-fourth to one and three-fourths inch, width three-fourths to seven-eighths inch; surface fairly smooth, translucent deep orange brown to light brown in color, overspread with a thin, bluish-gray bloom; skin firm, medium thick, and fairly tough, rarely wrinkled but often separating from the flesh in folds or blisters. Flesh firm and meaty, translucent amber brown in color, three-sixteenths to one-fourth inch thick. Seed oblong-obovate to oblong-elliptical, blunt at base and broadly pointed at apex, seven-eighths inch long, three-eighths wide; smooth, grayish brown or russet in color, ventral channel narrow or almost closed. Flavor rich and extremely pleasant, never cloying the palate, though it be eaten in quantity every day.

Khaláseh, Khalasa, Khalasi, Khalas, Quintessence, a name well describing the Arabic estimate of this, the most famous date of the Persian Gulf region. Its home is around the town of Hofhúf in the district of Al Hasa, anciently called Hajar; the variety has been spread to Oman, Busreh, some of the Persian coast districts, and I even found one palm at Baghdád. Its fruit was formerly exported very widely, to Mesopotamia, India, and even Zanzibar; of late years almost the whole of the yield has been absorbed by the nomads of the interior of Arabia, who are thorough connoisseurs of dates, and send their caravans each year to Hofhúf to carry off as great a quantity of this variety as is obtainable.

Little definite information is available regarding the culture of this date in its native home, but it would appear to be fairly plentiful, for the Turkish

census of 1871 counts 2,000,000 palms around Hofhúf. Our principal authority is the English Jesuit Palgrave* who was, I believe, the first to bring the variety to notice in recent years. He writes:

“Almost the whole space between Hofhoof and Mebarraz, a distance of about three miles, is filled up with gardens, plantations and rushing streams of water. Here and for many leagues around grow the dates entitled Khalas—a word of which the literal and not inappropriate English translation is ‘quintessence,’ a species peculiar to Hasa and *facile princeps* of its kinds. The fruit itself is rather smaller than the Kaseem date, of a rich amber color, verging on ruddiness, and semi-transparent. It would be absurd to attempt by description to give any idea of its taste; but I beg my Indian readers at least to believe that a ‘Massigaum’ mango is not more superior to a ‘Jungle’ than is the Khalas fruit to that current in Syrian and Egyptian marts. In a word, it is the perfection of the date. The tree that bears it may by a moderately practiced eye be recognized by its stem, slenderer than that of the ordinary palm, its less tufted foliage and its smoother bark As to the Khalas in particular, its cultivation is an important item among the rural occupations of Hasa, its harvest an abundant source of wealth, and its exportation, which reaches from Mosoul on the northwest to Bombay on the southeast, nay, I believe, to the African coast of Zanjibar, forms a large branch of local commerce.”

In the half century since this was written, Hasa has been entered only by two or three explorers, none of whom has added much to this account. I

*Palgrave, W. G. Narrative of a Year's Journey in Central and Eastern Arabia. London, 1863.

tried to visit Hofhúf in 1912 but was forbidden by the Turkish authorities to land, as they refused to be answerable for my safety; and in this they were absolutely justified, since earlier in the year a newly appointed governor had been held up on the coast for weeks, buying up some of the nomadic shaykhs and collecting a big enough escort to force his way through the rest who blocked his progress to his capital. Since then the Arabs have risen and expelled the garrison, and the province is plunged into an anarchy which will probably make it impossible to secure any more offshoots for some years to come.

In Wádí Samáil of Oman, however, I found nearly 1000 palms of this variety, and was told by natives that in some of the interior oases it was quite common. The fruit is of good quality there, but is admitted by its owners to be not equal to that of Hasa; at Busreh and other coast localities it is inferior; at Baghdád good. It may be concluded, then, that this palm likes a dry situation, and, probably, sandy soil. In Hasa it is irrigated copiously, and largely from hot springs; this may be one of the secrets of its excellence. It ripens September 1, or earlier, and the yield is only moderate—from 100 to 125 pounds a year. It bears fruit at an early age after being planted; offshoots are considered fairly hardy. Only a limited quantity of fruit is placed on sale in the Persian Gulf region nowadays, but it brings twice the price of other varieties. It is usually packed in five-gallon kerosene cans, to protect it from sand on the caravan route to the coast; for the interior trade, I presume that it is packed in skins and palm-leaf baskets. In Oman one of the favorite methods of keeping it is to extract the seeds and make it into

a paste which is kept in cans; thus treated it will keep indefinitely, and is more attractive than the paste of any other variety of date. There is still some export from Oman to Zanzibar, particularly in the form of presents from Omani growers to their relatives in the African island (for that part of Africa was colonized, and the slave trade exploited, by Arabs from Oman; and for years Zanzibar formed an integral part of the latter kingdom.)

Although the variety comes from a frostless locality, it has proved entirely hardy at Baghdád, and there is every reason to suppose that it will be exactly adapted to conditions in such a region as Coachella Valley. It has not yet fruited in the United States; several attempts were made during the last decade to introduce it, principally with offshoots secured on the island of Bahrayn, but all failed. This year, however, it was imported by the West India Gardens on a scale large enough to give every chance of success. I secured 100 offshoots in the oases of Oman, and although prevented from entering Hasa personally, was yet able to secure 400 offshoots from that region, through the kindness of Rev. Gerrit J. Pennings of the American Mission on the island of Bahrayn. He secured for me the services of a capable native, Abdallah b. Mubarak, who was willing to take the risks of a trip to the interior, and who carried out his commission with ability, in the face of a good deal of personal danger, although he was not able to prevent Beduin raiders from getting away with several camel loads of the precious plants, on his way back to the coast.

The variety is, in my opinion, fully equal to Deglet Núr, being even lighter in color and having



HOME OF THE FARDH DATE

One end of Samail Valley in eastern Arabia, where practically all Fardh dates exported to the United States are grown.

more of the characteristic flavor which is usually associated with the date. By Arab packing it sometimes becomes soft, but by American methods it should pack fully as well as the North African date, and I believe that when American Khalásehs are put on the market they will be considered as fine a date as the world can produce. The following description is of specimens obtained directly from Hofhúf: Form oblong to oblong-ovate, slightly widest at or near the center, rounded or slightly flattened at the base, rounded to broadly pointed at the apex. Of firm, solid consistency, keeping shape excellently. Size medium, length one and three-eighths to one and five-eighths inch, breadth three-fourths to seven-eighths inch. Surface slightly sticky, rather smoother than the average, with a delicate satiny sheen. Color light orange brown with a tinge of ruddiness or deep reddish amber. So translucent that the outline of the seed can almost be seen. Bloom slight, bluish gray. Skin firm but quite tender, adhering closely except for an occasional small fold or blister, loosely wrinkled indiscriminately, but not deeply so. Flesh firm and solid but very tender, caramel-like in consistency, of delicate texture, one-quarter inch in thickness, reddish amber in color and entirely free from fibre. Seed oblong-elliptical, slightly pointed at both base and apex, three-fourths to seven-eighths inch in length, one-quarter to three-eighths inch in breadth, broadest near center, smooth, gray-brown in color, ventral channel almost or wholly closed. Flavor delicate, but deliciously bringing out the characteristic date taste.

Khanayzí, Khanezi, said to be the name of a tribe; a soft date from Oman, also found in limited quantity at Busreh. It is considered one of the best general purpose varieties of the region and is eaten fresh, cured or boiled. In appearance it closely resembles Khasáb, but is earlier, ripening in September. The yield varies greatly, sometimes being large and in other years insignificant, but it is probable that this characteristic will be overcome by proper treatment. The only specimens which I have seen were boiled; they may be described as follows:

Length one and one-fourth inch, breadth eleven-sixteenths, usually broadest about middle; apex bluntly pointed. Dark reddish brown in color (this is said to be the color of the fresh date, too). Flesh one-eighth to three-sixteenths inch thick; soft, not brittle. Seed small but thick; three-fourths inch long, one-fourth wide; tight in cavity; no fibre. Flavor of the boiled date insignificant, but when fresh the variety is considered of first quality.

Khustáwí, Khastawi, Kustawi, originally Khastawani (Pers.), The Date of the Grandees, a delicious dessert date, the most important of its type at Baghdád, from a commercial viewpoint, and one that has proved admirably adapted to American conditions. At Baghdád it is considered a rather shy bearer, in comparison with the commoner Záhídí, although the yield is from 75 to 150 pounds. The dates ripen fairly early, in the first half of September. They pack well and keep well; Arabs assert that they are the least liable to attacks of worms. This date is certain always to be a favorite with those who like the richer and sweeter varieties of this fruit.

Arabs easily distinguish the palm in a plantation by the dark yellowish color of the petioles and lower part of the leaves, as compared, for instance, with the lighter colored and strictly glaucous Záhídí. Its spines are stout but rather short, inclined at a sharp angle to the petiole. Offshoots are always small in size.

In form, the date is oblong-oval, broadest near center and narrowing gradually toward the rounded or slightly flattened base and the rounded apex. Size medium, length one to one and one-half inch, breadth three-fourths to seven-eighths inch. Surface smooth, glossy, translucent orange brown to bright brown in color, bloom unnoticeable. Skin rather thin and delicate, usually without wrinkles or folds, adhering closely to the flesh, which is translucent golden brown in color, entirely free from fibre around seed, one-fourth inch thick, possessing the caramel consistency to a high degree. Seed small, oblong-obovate, slightly pointed at each end, three-quarters inch long, five-sixteenths inch wide, smooth, russet, ventral channel open. Flavor unusually rich on account of the syrup with which the whole fruit is filled, yet not cloying; the characteristic date taste pronounced.

Laquí, Lagoo, Lagou, The Distorted Mouth (?) from its peculiar curved outline; the word originally means a kind of facial paralysis. An early and esteemed Tunisian soft date which has given good results in California. It is an important date in the native export trade, because of its excellent shipping qualities and the fact that it keeps its shape well. Ripens in September.

The crown of foliage on a Laquí palm is rather small, leaves short and rather stiff, with long and rather wide leaflets. The short, densely crowded fruit-clusters do not equal the leafstalks. Stalks and branches of the fruit-clusters are orange colored.

The date, as grown in California, is one and three-fourths inch long, three fourths inch wide, bay, chestnut or maroon in color; oblong but usually slightly curved, base flattened, usually depressed, apex broadly pointed. Skin fairly thick but tender, shiny, ochraceous, often raised in large blisters but not otherwise wrinkled or creased. Flesh one-eighth inch thick, golden brown in color, rather tough. Seed one and one-eighth inch long, five-sixteenths wide, tapering very little from rounded base to broadly pointed apex, russet color, surface roughened, ventral channel open, germ pore below middle if distinguishable. Flavor sweet, heavy.

Majhúl, Medjool, Medjeheul, "Unknown,"* such a strange name for a date that its authenticity has been questioned; yet it seems that this is the name by which it is actually known in commerce in the Tafilalet region and Southern Algeria today. It is worthy of note, however, that the travelers who explored the Tafilalet oases in the last century do not mention any date of that name among the famous ones of the region.† As a result of an investigation

*Perfect passive participle of the common verb jahal, "to be ignorant." There is a date with the same name in Madína, Arabia.

†Gerhardt Rohlfs (Reise durch Marokko, Bremen, 1868) says the best are Bú Zakrí (which has been famous in the Sahara for centuries), Bú Hafs and Faqqús. W. B. Harris (Tafilet, London, 1895) says the best are Bú Zakrí and "Bou Kefous" by which he doubtless means Faqqús. Both these varieties, or at least ones with identical names, are still found in Southern Tunisia. In the time of Edrisí (A. D. 1154) the best Tafilalet date was Al Birní (Geography, p. 70; tr. by Dozy and De Goeje, Leyden, 1866).

recently made by French authorities, it was learned that some of the educated natives considered that the name was originally Madqúl,* which would be perhaps an ungrammatical variation on the word Deglet; this is quite possible, but in any event the significance of the name would be the same, pointing to an adventitious variety which could not be related to any of those formerly known by the oasis dwellers. In the United States the date is probably more often called merely by the name of its locality, Tafilalet,† and in London, the principal market for the variety, it regularly passes under the corruption of Tafilat.

The Tafilalet oases, in the Saharan part of Morocco, have for centuries been famous for their dates, which probably owe their excellence to the intense and long-continued summer heat, the abundant water supply, and the skilful cultivation by the residents. Even in the seventeenth century we are told that "Most of the dates which are brought into Europe are transported from Tafilalet".‡ An examination of the seedling dates of Spain suggests that many of them are seedlings of Majhúl; there is a fine avenue of old palms near Malaga which can be identified as this variety with a good deal of certainty. Many of the seedlings grown on the Pacific coast of Mexico seem to be of the same strain. Thousands of

*Vulgar perfect passive participle of verb ádqal, "to bear daqal dates." There is an Algerian variety named Mudqál, which is the correct form.

†This I consider to be the correct spelling. The name is founded on Filal, a district in Arabia from which the original settlers are reputed to have come. The initial Ta is a Berber word oftener seen in the form Ait, and means "sons of," while the final syllable is merely a grammatical addition to make the word feminine. The name, therefore, tells that this is the district peopled by Filal immigrants. The French often use the contraction Tafilelt.

‡Ogilby, John. *Africa*, p. 105. London, 1670.

seedlings have been planted in the United States during the past few years, but up to the present it has been impossible to secure offshoots on a commercial scale because of the state of anarchy and warfare in which Morocco is sunk; a few authentic offshoots have nevertheless been brought to Southern California by the Bureau of Plant Industry and the West India Gardens of Altadena. It will be obvious, however, that the variety has not yet had a test in the United States, and all plantations of it are made merely because of its general merit and commercial reputation.

The region has never been visited by a date expert, but French military authorities have secured as much information as possible about Majhúl, at the request of Dr. L. Trabut, botanist to the Algerian government, and through his courtesy I was given access to their reports.

Majhúl, says Lieut. Neigel,* is found in large quantity in all the oases of Tafilalet, particularly in those of Ghorfa and Er Reteb, but is not so abundant as other varieties of inferior quality. The people themselves live on these inferior dates, most of the Majhúl being exported. Those from Er Reteb are considered the finest and largest. The variety is propagated only by offshoots, which, transplanted in February or March, bear in from four to six years. They do not demand any more care than other varieties.

The dates are artificially ripened, as follows; after the dates have turned completely yellow the bunch is cut and they are picked from it, care being taken not to detach the calyx from the fruit, as this would permit the entrance of dirt and insects. They

*Report dated March 26, 1912.

are then spread on the ground in the sunshine for a week, but it appears that they are not removed or protected in any way at night, the chill air being supposed to make them firmer. They are turned over daily, and as they become sufficiently soft they are sorted out and stored until exported.

The price in Tafilalet at harvest time varies according to the abundance of the crop, from thirty-five to ninety cents the abbar, a weight of about fourteen pounds. Three-fourths of them are exported via the South Algerian Railway and Oran, the rest via Fez in Morocco. England gets the bulk of the crop, but there is also a steady demand from Spain; in each country they command the top market price.

The dates usually arrive in London just before Christmas, and there is a great demand for the first ones, the price at wholesale sometimes reaching ninety-two shillings per hundredweight. The average wholesale price, later in the season, is forty or fifty shillings, and they are sold by retailers at twenty to twenty-five cents a pound, while the Persian Gulf and Egyptian dates bring five to ten cents a pound. In Spain the price is usually about twenty-five cents. At present practically none of these dates reach the American market.

The variety is evidently late in maturing, and probably will be suited only to the hottest and driest regions in the United States, such as Coachella or Imperial Valley. Because of its large size and good keeping and shipping qualities, it promises to be a very profitable one if it can be successfully grown in this country. It may be technically described as follows:

Form broadly oblong varying to oblong-ovate, two inches in length, one and one-fourth in breadth,

broadest near center or slightly nearer basal end and narrowing slightly toward the broadly flattened base and broadly pointed apex; surface deeply wrinkled and creased indiscriminately, bright bay to deep reddish brown in color (the light bay color is perhaps due to crystallizing of sugar under the skin). Skin very thin and tender, adhering closely to flesh over the entire fruit. Flesh firm, meaty, nearly three-eighths inch thick, brownish-amber in color, translucent, with practically no fibre around seed. Seed one and one-fourth inch long, three-eighths inch wide, elliptical in form but slightly widest near apex; smooth, brownish gray, germ pore nearer base, ventral channel almost closed. Flavor rich and delicious, the characteristic taste of the date being pronounced.

Makantishí, M'Kentichi, Amekentichi, Emkentshi, Kenteeshy, Kentichi; (the word Degla is often added to the name and it is frequently confused with Mashí Degla of similar appearance), The Early Arriving. A small dry date which is very common in Algeria, probably because it demands little irrigation or fertilization. Mountain dwellers prefer it as a steady diet, and in the oases it is considered the best food for children—perhaps because it is cheap. It can be eaten when fresh and soft (rutab) as well as dry. In spite of its name, it is not particularly precocious, but bears fairly heavily. Offshoots are notably vigorous and hardy. It has done well in the United States, but it is never likely to have great value, as there are so many larger and better dry dates. It is worth noting, however, that this is one of the two dates which have been found, in which the contents remain predominantly cane



HALAWI PALMS AT BUSREH, ARABIA

Plantations in this district are irrigated twice a day, when the tide backs up the fresh water and fills the canals intersecting the plantations.

sugar to the very end (the other is Deglet Núr.)

The fruit is one and three-eighths inch long, eleven-sixteenths wide, often slightly curved, broadest at or below middle, tapering slowly to flattened base and more abruptly to bluntly pointed apex. Color deep chrome to saffron, with a slight reddish bloom. The dull, thin, and tender skin adheres closely to the flesh, which is raised in ridges and furrows, mostly longitudinal. Flesh one-eighth inch thick, nearly white, hard and dry but rarely brittle. Seed one inch long, five-sixteenths wide, rounded at both ends, russet to wood brown in color; ventral channel open or partly closed, germ pore slightly nearer apex. Flavor sweet and nutty, with almost no astringency; agreeable.

The palm is tall and stout, strong and vigorous, with coarse, heavy foliage, long leaves, and numerous but rather distant long and broad leaflets. Branches of fruit-clusters orange buff; their stalks are curved, forming nearly a semi-circle, but do not hang down below the foliage. Thrives in poor soil and is considered resistant to alkali. Reported to Kearney as one of the most productive varieties in Tunisia, and so highly esteemed by natives that they are reluctant to part with offshoots.

Maktúm, Maktoom, originally Makdúm, The Bitten, because of the short, transverse scars on the skin, which, to Arab imagination, resemble the imprints of a miniature set of teeth. A rare variety, but as good as any in Mesopotamia; it has proved itself admirably adapted to California and Arizona conditions as well, and can unhesitatingly be recommended for commercial planting. It is certain to

have a permanent popularity, not only because of its superior quality but because of its relatively large size. It is not common even around Baghdád, and always brings a high price in the market; the commercial supply seems to come from Mandalí, Karbala, and Hilleh. At Busreh it is very rare, ripens about October 1, and is reputed to be a shy bearer. There is also a small date of the same name at Busreh, which I did not see, but which is considered almost worthless, and Arabs say that it is merely a degenerated form of the same superb variety.*

At Baghdád it ripens late in September or early in October, and is said to bear slightly less than Khustáwí. It is difficult to account for the scarcity of palms of this variety in Mesopotamia, unless it be because the Arabs object to its light yield; for it has almost every other desirable quality. The market is usually cleaned of Maktúm dates within a short time after the harvest, and no offshoots are so expensive.

In the United States the variety has given a heavier yield, due probably to the better care which it receives. Even under the unfavorable climatic conditions of the Tempe, Arizona, garden, the fruit is firm enough to pack in small boxes and sell as a dessert date, its luscious flavor appealing to nearly everyone. The palm there shows decided vigor in growth; the fruit ripens a little later than Haláwí, and is practically immune from damage either by winter or summer rains.

*Cf. report of Major F. E. Crow, British Consul at Busreh, in Kew Bul. No. 7, p. 286, London, 1908: "Maktúm, much smaller than Chibehab, and used for the same purpose," i. e., boiled. The occasional degeneracy of the best varieties, like Deglet Núr, Khaláseh and Maktúm is a subject which merits study, and anyone observing such instances should report on them.

The fruit, as grown at Baghdád, is in form very broadly oblong to oblong-obovate, usually slightly broader near center of fruit and narrowing almost imperceptibly toward the flattened base and the flattened to broadly rounded or abrupt apex. Size medium large to large, dimensions being: length, one and one-fourth to one and one-half inch, breadth at widest point, seven-eighths to one inch. Surface uneven, somewhat glossy, a beautiful, translucent, golden brown in color, overspread with a thin, bluish-gray bloom. Skin firm, medium thick but not tough, deeply wrinkled in all directions and occasionally separating from the flesh to form coarse folds and blisters. Flesh light golden brown, translucent, very delicate in texture, soft and almost melting in the mouth, three-eighths to five-eighths inch thick. Seed broadly oblong, rounded to blunt at base and tapering sharply to apex, length three-fourths to seven-eighths inch, breadth five-sixteenths inch, surface fairly smooth, cinnamon brown in color, ventral channel almost or wholly closed. Flavor very mild, with only a suggestion of the characteristic taste of the date, in which respect it resembles the Sabaran Deglet Núr more closely than any other Mesopotamian date; sweet but not too much so; extremely pleasant and not cloying, as it contains little syrup.

Fruit grown in California is similar; firm enough to be handled and pack well, but the flesh remains tender and melting even after the lapse of a year. After some months, however, the evaporation of moisture leaves the skin in large blisters of a tawny olive color.

Maktúm Ahmar, The Red Maktum, is distinguished by the Arabs as a separate variety, although it is merely an inferior form of the preceding, which is sometimes called Maktúm Asfar ("yellow"). The red variety is a little darker in color, and the flavor is said to be not quite so good, but it is rare and commercially of no importance.

Manakhír, Menakher, Monakhir, The Nose Date (lit., The Nostrils), a rare, large, and desirable variety from Tunisia. The only specimens in the United States are owned by the Department of Agriculture, and there seems little chance of getting more, as the palm is almost extinct in Tunisia. The natives account for this by the story that their rulers, under the old régime, acquired a great fondness for the date, and sent agents into the region at harvest time to appropriate the entire crop, which they usually forgot to pay for.* Consequently the owners decided it would be more profitable to them to grow a poorer date which they themselves could enjoy, and stopped planting Manakhír offshoots, even cutting down old trees in some cases. The few trees now left are jealously guarded by their wealthy owners and offshoots can not be had at any price.

The date is soft, dark in color, and somewhat similar to Deglet Núr in flavor; many Americans as

*This is an old story in Arab communities. Al Bakrí says that in the Zibán almost a thousand years ago "Ubayd Allah the Fatimide decreed and reserved for his own use all the harvest of Liari dates and ordered the local officials to forbid the sale of this variety and send all that were grown to him." Another MS. calls the variety Kabari; the writer says it was white and smooth, but I can not identify it with any variety grown there now. Al Bakrí, *Deser. of No. Africa*, 1068 A. D. Tr. by de Slane. Paris, 1869. P. 126. Kearney says the rarity of the variety Selatny (Sultání?) in Tunisia is accounted for in the same way as that of Manakhír.

well as Arabs consider it superior. It has the advantage of being larger, and possibly of keeping better; the flesh remains soft and firm, the skin dry and clean. It has a considerable amount of fibre in the seed cavity, however, particularly if it be picked before it is fully ripe. American experience has shown this characteristic to be most fully developed while the palms are still young; those in California produced inferior fruit during their first few years, but have been improving each year. The date in Arizona seems to be of second quality.

The fruit is late, ripening toward the first of November. The yield is small during the first few years, but when adult the palm is said to bear as much as 220 pounds, single clusters sometimes being heavier than a strong man can carry.

The palm is formidable in appearance, leaves being long, broad, and rather stiff and heavy, crowded with very numerous long leaflets, and their stalks armed throughout with long, stout spines. Fruit clusters are short and dense, their stalks bright yellow, rather short, stout and only moderately curved, so that the dates do not hang down below the leaves as with Deglet Núr and many other varieties, but are almost hidden by the foliage. It proved sensitive to frost last winter.

Fruit from two to two and one-third inches long, about one-half as wide, oblong, broad and rounded at both ends, dull orange yellow before maturity, brownish maroon when ripe, with a purplish bloom. Flesh one-fourth inch thick, the white, fibrous lining to the seed cavity well developed. Seed one inch long, two-fifths to one-half as wide, russet to chestnut colored, its surface uniformly roughened with small

pits and fine wrinkles, ventral channel frequently closed, germ pore usually distinct, always above middle of seed; seed broad at both ends. Flesh soft and sirupy at moment of ripening. Flavor delicate. (Kearney).

Marídhch, The Invalid, an ordinary soft date from the Zibán of Algeria, said to resemble Kasbeh. It is described as light reddish brown in color, broad in proportion to its length, palatable, keeping well, and ripening in mid-season. The yield is always good and sometimes very large. Not commercially important; has not yet fruited in the United States.

Masarraf, The Marketable, (?) a dry date from the Zibán of Algeria, which has never been common, but boasts of great antiquity and has been esteemed by every generation. It is described as long and slender, light brown in color, flesh firm but not hard. If picked at the proper stage and packed closely it remains a soft date. Yield fairly heavy; season rather late. Occasionally sold in Algiers, where it brings a good price. If allowed to hang on the palm until thoroughly dry it becomes very dark in color. Palms of the varieties Masarraf and Ghars are considered the two best for making laqmí, on account of the large amount of sap they yield; it is, therefore, probable that this variety is a vigorous grower. It has not yet fruited in the United States.

Mashí Degla, Mishi, Mecha Degla, The Purgative Seedling, a small and common Algerian dry date which is often confused with Makantishí. This tall palm bears a heavy crop about November 1.

The date is a little less than medium size, light bay or ochraceous in color, the flesh thin, dry and usually hard, with traces of astringency. Not desirable for planting in the United States.

Mirhage, see Amír Hajj.

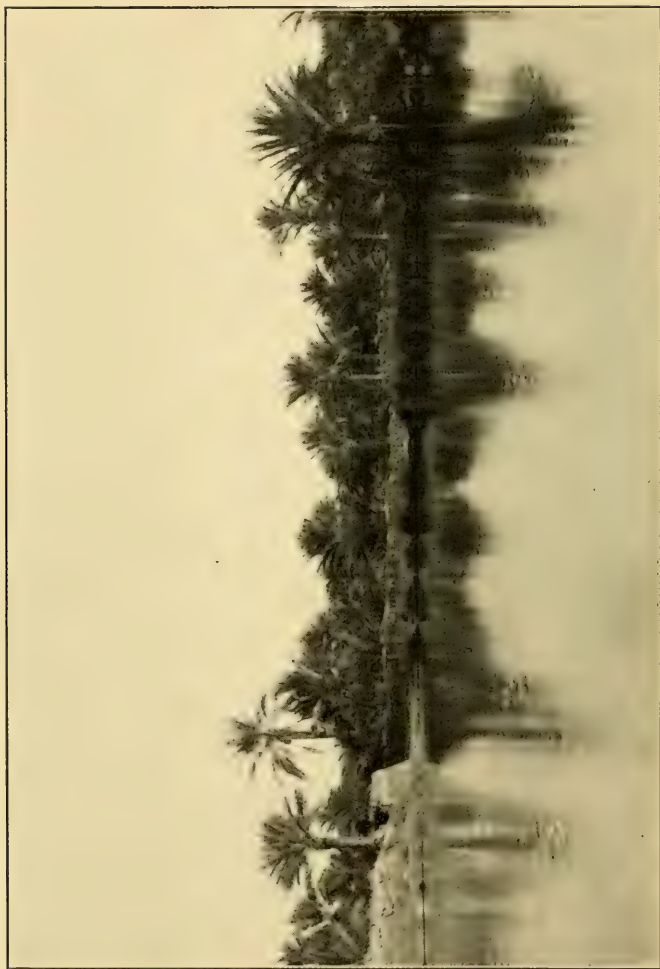
Muznaj, Meznag, vulgarly Bznag, The Thirst Producer, one of the earliest of Oman dates, and common. It is usually eaten only when fresh, or rutab. The yield is said to be very heavy, a palm often carrying twenty-five clusters. Fruit is long and slender. With native methods the dates do not keep well—but then, they rarely have a chance. The variety has not yet fruited in the United States. A letter from Consul Homer Brett in Masqat states that the first dates this year arrived on the market there May 20, and that they were of this variety, grown in an oasis which derives its water supply from a spring whose temperature is 105° F.

Naghal, Nagal, The Bastard, one of the most popular Oman dates, because it is the earliest to ripen, with the exception of Muznaj. June 1 may be taken as the date for its arrival at marketable condition, in an ordinary year. The date is of medium size or a little larger, long and slender, light brown in color; little eaten except in its fresh and soft condition, but can also be cured and keeps well. The yield of a palm of this variety is said to be heavy. Has not yet had an opportunity to show what it can do in the United States, but when the offshoots now here come into bearing they are likely to prove of great interest.

Najl al Pasha, Nazl, Nagl el Basha, Child of the Pasha, a rare but highly esteemed Egyptian variety which has produced notably good fruit in Arizona. It is a large and long soft date, excellent when fresh, (in which condition it is yellow and pulpy), but equally good when cured. It is then dark brown, the flesh full of syrup but firm enough to be handled easily and ship well. Some tasters have thought they could distinguish a slight vanilla flavor in it. The variety, which is similar in many characteristics to Birket al Hajjî, can be recommended for planting in the United States. It matures in October in Arizona, but should be considerably earlier in a more favored location. According to some writers the name is properly Naql al Pasha, The Pasha's Dessert.

Nakhleh Zíáneh, The Beautiful Palm, often called by ungrammatical natives Degla Zayyin, The Excellent Seedling; and in some districts Laún al Kasbeh, which suggests that it is a Kasbeh seedling in origin. A common and popular soft date of the Zíbán in Algeria, found more rarely over a much larger area. Noted particularly for its heavy yield, which sometimes reaches 660 pounds, according to native estimates. The date is described as of medium size, dark golden brown in color, flesh firm but tender, and of excellent flavor. When placed on the market it brings as good a price as any variety except Deglet Núr. Probably rather late in maturing; the specimens in the United States have not yet reached a bearing age.

Nakhlet al Pasha, The Pasha's Palm, an Egyptian soft date growing at the Mecca Experiment Station in



AN OASIS IN THE SAHARA DESERT

The town of Jama, which produces excellent dates, is in a region where the level of ground water is sometimes above the surface of the ground.

California. The small, dark brown dates ripen in late September, and are of excellent flavor but do not keep well. The yield is heavy. It is doubtful whether this palm is correctly labeled.

Qintár, colloquially Al Guntar, The Hundred-weight, probably referring to its yield. One of the attractive Persian Gulf varieties recently introduced to the United States. A small date, but highly prized by the Busreh Arabs. It is so full of syrup that it has to be brought from the palm in a basin, but if cured properly this drains away, leaving a date of delicious caramel consistency, quite similar to Khaláseh in flavor. The palm begins bearing at the age of seven or eight years in Busreh; its fruits mature late in September or early in October, and will keep for seven or eight months. The variety is rare.

In form the fruit is broadly oblong to oval, widest at or near center, narrowing slightly toward the rounded or slightly flattened base and the rounded apex. Size medium small, length one and one-eighth to one and three-eighths inch, breadth at widest point five-eighths to seven-eighths inch. Surface slightly rough, translucent reddish brown to purplish maroon in color, overspread with a thick bluish bloom. Skin rather thick but not tough, coarsely wrinkled and adhering to the flesh closely. Flesh very firm and of caramel consistency, one-fourth inch in thickness, translucent, deep reddish amber colored; the fibrous lining of seed cavity almost wanting. Seed oblong-obovate, blunt at base and sharply pointed at apex, three-fourths inch long, five-sixteenths inch wide, smooth, fawn-colored,

ventral channel almost closed, germ pore nearer apex than base. Flavor exceptionally rich and pleasant.

Qurn al Ghazál, Qern el R'azal, Guern el Rhezal, The Gazelle's Horn, a name descriptive of the peculiar appearance of this long, slender and curved date from Algeria and Tunisia. It is found in very limited numbers in all the oases, and is said to be one of the principal varieties at Gabes, Tunisia, and on the island of Jerba.* The palm, which is tall and slender, bears heavily; the date is described as reddish brown in color, with thin flesh which is firm, or even dry, but not hard or brittle. It ripens in October.

Qush† Batásh, The Sweetmeat (Pers.), one of the earliest dates of Oman, ripening in June, sometimes even in the first half of May, according to Arabs—but it should be remembered that an Arab's idea of ripeness is not that of an American, and that for an

*The island of Jerba, on the coast of Tunisia, is thought by many to have been the one described by Homer as the residence of the Lotus Eaters. In that case the fruit which so attracted them may have been dates, and not the worthless jujube (*Zizyphus lotus*) which the old botanists identified as the object of the description in the Odyssey.

†This word is used in Oman as Degal is in other regions, or as Khalt is used in Tunisia, to designate a date of adventitious origin, ordinarily a seedling; and often, but by no means always, it indicates a date of inferior quality, just as the two other words do. Qush Batásh would, therefore, be called Degla Batásh in Algeria or at Baghdád, and Khalt Batásh in Tunisia. For strict accuracy, it should be transliterated Qushsh or Qashsh. The etymology is disputed; many authorities relate it to Kushsh, a word which designates the pollen of the male palm; others see in it a Persian root. In general the classical lexicographers define it in the same way that they do the word Degal. The word Khalt is, I believe, not used classically in the sense which it carries in Tunisia: it means "of mixed blood; of uncertain origin." It does not, as has been said, mean a dry date, any more than Degal means a soft date, as has sometimes been supposed by date students.

Arab a date is ripe enough to eat when it is still so hard and astringent that live stock would hardly touch it in the United States. The variety is rare, but much in demand because of its earliness and its heavy yield. It is rarely cured because there is such a demand for fresh dates at the beginning of the season that they are never given a chance to hang on the tree after they are edible. The fruit is described as slender, very dark brown or black in color. Has not yet fruited in the United States.

Qush Farfara, name of an oasis (the word is perhaps formed to imitate the murmur or bubbling of running water), sometimes called the Farfara Fardh; a soft date of Oman, almost identical with the genuine Fardh of commerce, but growing in a different region and ripening a month earlier; the quality is also considered slightly inferior. In actual practice the two dates are indiscriminately mixed together for export. A common variety, but not a very heavy bearer. Arabs say it keeps better than the ordinary Fardh, showing no deterioration for at least three years after it is picked.

Its remarkable keeping qualities are illustrated by the experience of a sharp dealer at Masqat, who for several years, when the Mecca pilgrimage fell in summer, sent these dates to Mecca and palmed them off on the pilgrims as fresh dates of that year's crop; they were so well preserved that the deception was easy, although the dates when sold were at least ten months old. They were put on the market earlier than the Mecca dates could ripen, and the speculator secured a fancy price for them. The game was finally exposed when one shipment was found riddled

by worms; as these are never found in dates until they have been stored for some months, the pilgrims promptly decided that the dates which they had been buying were by no means fresh from the tree, as represented, and they drove the shrewd Omani out of business.

The Farfara Fardh was introduced to the United States only in the present year.

Qush Hasás, The Indigestible (lit., rumblings of the belly), a small, yellow, dry date of Oman, much esteemed by the Arabs in spite of its name. Has not yet fruited in the United States. A fairly common variety which bears well; rarely eaten fresh, as it is inferior in that stage. Ripens in September, concurrently with Khanayzí and Khaláseh.

Qush Shahm, Sheham, The Pulpy (the word originally means fat meat, but is also regularly used for the flesh of a fruit). An early soft date from Oman, brought to the United States only this year. It is of medium size, long in proportion to its breadth, yellow when fresh but later turns dark brown. The yield is fairly heavy; it ripens in June, when it is particularly valued as rutab; but it also cures and keeps well. It is highly esteemed by the Arabs.

Qush Zabad, The Butter Date, a small variety from Oman, and one of the best soft dates of that region. Ripens in mid-September and is said to bear very heavily. Good when fresh, but usually cured, when it keeps easily for a year. The variety is fairly common in its home; has not yet fruited in America.

The date is one and seven-sixteenths inch long, fifteen-sixteenths inch wide, broadest near base and tapering very slightly to blunt apex. Color reddish brown. Skin tender and color of café au lait when it blisters. Has a tendency to stickiness, but this can probably be obviated by proper handling, as the flesh has an excellent caramel consistency, and is one-quarter inch thick. Seed small, three-quarters inch long, one-quarter inch wide, tight in cavity; some fibre, but soft and not noticeable in eating. Flavor mild.

Rashídí, see Samaní.

Rhars, see Ghars.

Ríshtí, Arishti, Arehti, Archeti, The Feathery. With the definite article in Arabic it is Al Ríshtí, pronounced Ar Ríshtí, whence the incorrect spelling which has become current. A large and attractive date from Algeria and Tunisia, noted for its heavy yield. Soft but firm, admirable for keeping and shipping; eaten at all stages. It is the favorite date of Algerian Jews. Some natives consider it best just before it is fully soft, others declare it not worth eating until it has been stored for four to six months. It ripens rather late, about the middle of October, and frequently bears from 200 to 250 pounds of fruit. It has given good results in the United States, but its offshoots have proved delicate and difficult to root.

The palm has a stout trunk but particularly graceful foliage, as its name indicates. The leaves are green, soft, and drooping, leaflets long, narrow, and

rather sparse, spines few, slender and weak. Stalks and branches of the fruit-clusters are pale orange.

Fruit two inches long, one and one-third inch wide, broadest near center or slightly above, tapering gently to rounded or bluntly pointed apex and flat or depressed base. When fresh it is light bay or hazel brown, which changes to dark chestnut as the date cures; and the thin and tender skin at the same time rises in loose, indiscriminate folds and blisters of a cinnamon color. Flesh three-sixteenths inch thick, firm but tender. Seed one and one-fourth inch long, one-fourth inch wide, brownish terra cotta color with some gray near base, rounded or broadly pointed at each end, germ pore slightly nearer apex than base, ventral channel deep but nearly or quite closed, surface of seed irregularly roughened. Flavor pronounced but agreeable, nutty, not cloying.

Ruhm al Ghazál, a variety brought from the oasis of Siwah (Jupiter Ammon of the ancients) on the frontier between Egypt and Cyrenaica, which has produced very good fruit in California. It may be the same as Ghazálí of the same oasis, which is said to be "not very productive, though its dates are marvelous in flavor, appearance, and power to keep long." A variety of the same name grows in the delta of Egypt, but its identity and relationships have not been worked out. Dates from Siwah, recently sent to the United States under the name of Gorm Gazaly, may be the same thing.*

*S. P. I. Inventory, Dept. of Agric., No. 32896. The name is there translated Antelope's Abode; it is more likely Jaram al Ghazál, The Gazelle's Dry Date, or Qarm al Ghazál, the Gazelle's Food.

S'aídí, a date grown in Kharjeh, Siwah and other western oases, and averred by its friends to have the finest flavor of any date of Egypt. It is probably of Nile origin, however, S'aíd being the time-honored native name for Upper Egypt. Ripens in September. It is the chief variety in the oasis of Kharjeh, whence it is exported in considerable quantities. I believe that only seedlings are to be found in the United States at present, but it is a promising variety for such locations as Coachella Valley.

Samíaní, said to be named after a village, one of the best Egyptian dates, but ripens rather late. Chiefly grown on the coast near Rosetta, in a sandy soil, and without inundation or surface irrigation; exported in fancy packages at remunerative prices. The fruit is described as thick, almost ovoid, tapering at apex; amber yellow in color, spotted or smeared with red. Seed small. Flesh thick but slightly coriaceous. Has not yet fruited in the United States. The variety is sometimes called Rashídí.

Sarna, Sarni, perhaps originally Sármá, The Unirrigated (lit., a desert without water); a popular dry date of Oman. In Samáil I was told that it ripened late in August and was not eaten rutab; in Masqat it was declared to ripen in June and to be eaten principally fresh. Possibly two varieties are united under one name; in each case the color was described as yellow. The date is said to be round in shape; the yield average. Offshoots introduced to California have not yet had time to bear fruit.

Sayir, Sayer, The Fibrous (?), one of the most widely grown dates in Mesopotamia, although of inferior quality. It is also called Usta'amrán, and by that name is usually known at Baghdád; some experts profess to see a slight difference between the two, but their efforts are hardly successful. At Muhammarah this name is usually corrupted to Sa'amrán; Sta'amrán and Sambran are other vulgar pronunciations sometimes heard. The date is exported to America to a limited extent, and plays an important part in native trade in the Persian Gulf; it is the principal date grown on the Euphrates and the middle Tigris. It bears heavily, (shortly before the first of October at Busreh), and will keep for a year or more. Said to do best in a sandy soil.

Form broadly oblong to oblong-elliptical, widest at center or slightly nearer apical end, whence it narrows almost imperceptibly toward the flattened base and broadly pointed apex. Size medium to medium large, length one and one-fourth to one and five-eighths inch, width three-fourths to seven-eighths inch; surface almost smooth, translucent, glossy dark orange brown in color, bloom almost unnoticeable. Skin rather thick and tough, smooth except for occasional wrinkles or longitudinal folds in which it separates from the flesh, which is rather soft, syrupy, one-fourth to three-eighths inch in thickness, deep amber colored, with considerable tender fibre around seed; the latter broadly oblong, rounded to blunt at both ends, three-quarters inch long, five-sixteenths broad, fairly smooth, grayish brown in color, ventral channel nearly closed, germ pore nearer base than apex. Flavor very sweet, not cloying, but not rich or distinctive in any way. The



KILLED TO MAKE PALM WINE

Plantation in Sahara Desert abandoned as result of failure of water supply; the palms were beheaded to secure their sap.

dark color of this date is its principal drawback. It has done well in America.

Sba el Aroosa. See Asabí al Arús.

Shukkar, Sugar, a fairly common date around Baghdád, and much esteemed, selling in the market for a higher price than Khustáwí. In general, it is only eaten fresh, although when packed in skins or boxes it keeps well. This date is brown in color, rather long but not otherwise large. It ripens in midseason and bears well.

Síwí, an Egyptian variety new to California. Said to be perfumed, very sweet and of good quality.

Sukkari, Sugary, probably would get more votes than any other if the Arabs of the Baghdád region were asked to name the best soft date. Sultan 'Abdul Hamíd, in fact, used to have a shipment of dates of this variety sent to him at Constantinople every year. At Baghdád the palm is rare; it is reputed to be more common at Baqúbah and Mandalí, but never appears on the market. Most of the dates are eaten fresh, but they also pack well. The palm is vigorous and hardy, but a shy bearer, ripening its dates from the middle of August to the first of September. If cured properly they have a perfect caramel consistency.

The date is oblong-ovate to elliptical in form, widest at or near center; thence narrowing slightly toward the flattened base and the broadly pointed apex. Size medium large, length one and three-eighths to one and five-eighths inch, breadth three-

fourths inch. Surface somewhat rough, translucent orange brown to light brown in color, overlaid with a thick, blue-gray bloom. Skin thin and tender, deeply wrinkled in all directions but adhering to the flesh closely. Flesh soft and very delicate in texture, three-eighths inch thick, clear, translucent, golden brown in color, with no fibre around seed. Seed oblong-elliptical, almost blunt at base and broadly pointed at apex, three-fourths inch long, five-sixteenths inch broad, smooth, russet, the ventral channel open. Flavor mild and delicate, agreeably rich but not cloying.

Sultání, The Sultan's Date, a name widely applied in Egypt and possibly covering more than one variety. The best known is a dry date grown in sandy soil in many of the western oases (as far west as Siwah) and also in Nubia. Ripens in September. It is said that this date used to be exported to Constantinople, where it was eaten by the Sultan, hence its name; this is probably a fable. The variety is short in proportion to its breadth; red at apex and lighter colored at base; flesh thin, dry and rather brittle; seed large. Said to be aromatic.

Said to be also called Kilma, in Nubia. Delchevalerie mentions a variety of the same name in Lower Egypt (province of Sharqia), which he describes as orange yellow, when fresh, (in which condition it is generally eaten), chestnut when cured; large and perfumed. He says it is also called Safar al Dunya, Voyage in the World—possibly because it was an object of export. It may be the Nubian date, changed by climate.

The variety has not yet fruited in the United States.

Sultání, The Sultan's Date, a variety scarce at Baghdád but thought well of, ripening about the middle of August. It is a soft date, long and large, brown in color; usually consumed fresh, because of its earliness, but packs well. Has not yet borne fruit in the United States.

Sukkar Nabát, Refined Sugar, a small, yellow dry date of Baghdád, very rare but highly esteemed, the Arabs comparing its taste to that of candied honey. The flesh is granular, but particularly melting for a dry date.

Sukkutí, see Ibrahímí.

Tabirzál, originally Tabirzád (Pers.), "Sugar Candy," a name appropriate to its peculiar but delicious flavor of burned sugar. It is always accented on the middle syllable. Unquestionably one of the best varieties at Baghdád, but not common, and rarely seen in the bazar. The palm has the peculiarity of ripening its fruits very slowly; they are ripe enough to eat in September, but not fully ripe until well on to the first of November. It is also the only Baghdád variety, say Arabs, the trunk of which ever branches. The yield is moderate.

Form broadly oblong-obovate, widest below center, whence it narrows slightly to the flattened base and abruptly to the broadly pointed apex. Size medium, length one and one-eighth to one and one-half inch, breadth seven-eighths to one and one-eighth inch. Surface undulating, translucent deep orange brown in color, overspread with a bluish gray bloom. Skin thin and rather tender, coarsely

wrinkled and folded, and often separating from the flesh, which is soft and tender, one-quarter inch thick, translucent orange brown in color; fibrous lining of seed cavity almost wanting. Seed broadly oblong, rounded at both ends, five-eighths to three-quarters inch long, five-sixteenths inch broad, smooth, light grayish brown in color, ventral channel narrow. Flavor distinctive, mild and pleasant, sweet but not cloying.

Tadala, Tedalla, a large soft date from the Mزاب oases of Algeria, where natives state that it sometimes reaches a length of three inches. In California and Arizona it attains a length of two and one-fourth inches. In color it is a dull amber, and its appearance is pleasing; the flesh is fairly firm but the skin excessively tender, so that even with the greatest care it can hardly be prevented from breaking when the fruit is taken from the palm. The season is early October, and the date is of the rutab class, that is, its fruit is good only when fresh. After being picked, it soon dries and shrivels, losing all flavor; it cannot, therefore, be considered a good commercial date, and should not be planted except in limited quantity for home use.

The palm is vigorous and is considered a heavy bearer; its leaves droop in a way which allows it to be distinguished among others without great difficulty. Considerable confusion exists among the palms of this name in the United States; three of the four palms at Mecca, California, appear to be seedlings, while at Tempe, Arizona, one of the palms listed as Timjúhart is evidently Tadala. The variety is not desirable in Arizona, any more than in California,

although it has distinguished itself at Tempe by the way in which it brings its fruit to maturity regularly, despite the most unfavorable climatic conditions.

Tazizaút, Tazizaoot, a soft date from the Mزاب of Algeria, apparently found to a limited extent over a much larger region in North Africa, although its nomenclature is confused. It is said to be common, and therefore offers great possibilities to the commercial growers of the United States, as it is entirely successful here and can probably be obtained in sufficient quantity to make its culture worth while. The fruit is large and firm, and keeps well, showing little deterioration either in color or flavor after the lapse of a year. It ripens early in September, but may be left on the palm for a month more without deterioration. In very heavy soils, such as those of the Salt River Valley of Arizona, it is later in maturing. It resists dampness and moisture very well. The yield is large, as many as seventeen fruit clusters having been produced in the fifth year and twenty-two in the eighth year on a palm in Coachella Valley. The variety not only matures but ripens perfectly on the tree.

The palm is strong and stout, seems equally well suited by light or heavy soil, and is decidedly hardy in winter. Its foliage is notably soft, the dry, hard point found at the leaf apex of most varieties being absent. The leaves are noticeably recurving. Offshoots are rather difficult to handle, however, on account of their loose structure and the low situation of the terminal bud; Drummond suggests that they be propagated in a very light soil or even in pure sand.

Bint Qabáleh, Bent Keballa; perhaps the proper spelling is Bint Qibleh, Daughter of the South, or Bint Qabbaleh, the Kissable Maiden; one traveler calls it Bint Khabala, which would mean The Shriveled. A rare variety from the Mزاب of Algeria, somewhat similar to Yatímeh or Al Qutár (q. v.); of medium size, inclined to be sticky, but of attractive appearance on account of its clear, light, amber color. It is considered by the Mزابites one of their best varieties, but although it has done well in the United States it will never be very desirable on account of its softness—the pulp becomes mushy if the air is humid at the time of its ripening. If carefully packed, however, it keeps well. Ripens soon after the first of October. Offshoots are difficult to handle, by reason of their loose make-up and the low position of the terminal bud.

Tafazwín, Tafazween. Sometimes the feminine form, Tafazwint, is seen. French writers call it Tafazaouine. A large, attractive and valuable date from Algeria and Tunisia, which has given excellent results in California. It can be used either as a soft or dry date, according to the stage at which it is picked from the palm, and the care taken in handling it. To make a soft date it should be picked when it begins to show translucent spots, and ripened indoors. If left on the palm it will become dry, but never hard. The fruit ripens early in October, the yield being fairly heavy; and because of its attractive appearance, excellent quality, and keeping and shipping properties, it is certain to be valuable.

The fruit is two inches long, or a little more, and seven-eighths inch wide. Bright bay color when

fresh, it changes to an attractive golden brown when it cures, and the blisters of the skin take a tan or hazel color. The date is thickest just below the base, tapering slightly to the bluntly pointed apex. The base is flattened. Skin thin and tender, adhering closely to flesh but indiscriminately wrinkled; sometimes raised in long folds and blisters. Flesh three-sixteenths to one-fourth inch thick, firm and translucent. Seed one and one-fourth inch long, five-sixteenths inch wide, slender, tight in cavity, golden brown in color, almost uniform in width throughout its length, rounded to broadly pointed at each end; ventral channel broadly open, germ pore close to base. Flavor particularly sweet, delicate and agreeable but not cloying.

Much interest has been created in Coachella Valley by a palm belonging to Fred N. Johnson of Indio, which was imported as an offshoot from Tunis by the Department of Agriculture, but given to Mr. Johnson without a label. My friend and colleague Henry Simon, of Arabia, California, who spent the winter of 1912-1913 in Algeria and Tunisia, and gave particular attention to the identification of this palm by comparing its fruit with those of the Sahara and getting the opinions of Arab growers, came to the conclusion that it was Tafazwīn, but with some slight differences which indicated that the California palm might have been the offshoot of a particularly fine seedling Tafazwīn. I concur with Mr. Simon in this opinion, but in order that the reader may form his own judgment, I give a description of Mr. Johnson's date:

Fruit two inches long, seven-eighths inch wide, usually tapering slightly from base to apex but

sometimes the reverse. Bright bay color, verging on cinnamon at the base and chestnut at the apex. Skin thin and tender, sometimes raised from flesh in straw-colored blisters. Often marked with numerous short, transverse scars (a feature that often, but not always, characterizes the Saharan Tafazwín). Flesh five-sixteenths inch thick, translucent; chestnut colored near surface verging to straw inside. Some fibre. Seed one inch long, three-sixteenths wide, cinnamon to hazel in color, ventral channel open, deep; germ pore slightly nearer base than apex. Flavor sweet but not heavy; good.

The giant cells of this date are nearly spherical, while Kearney describes those of his Tunisian specimens as angular and two or three times as long as broad. This is not a positive point of evidence, however, for the giant cells of Tafazwíns which I brought from Algeria are nearly the shape of those of the Indio palm—round or even pear shaped, although prevailingly angular.

With this evidence, certainly no one can say with confidence that the Indio palm is not Tafazwín. Either it or the imported palms of that name are well worth growing. Dates of this variety which I have kept loose for two years are still soft and in almost as good condition as when they were picked.

Tanasín, Tenaseen, Tanessin, Tenacine, Temacin, probably named after an oasis in the Sahara, a black date of medium size which has proved successful in the United States, particularly in Arizona. The palm is distinguished by its horizontal or umbrella-like crown of foliage.



BIRKET AL HAJJI PALM FROM EGYPT

Considered the best variety for Arizona. Lost many leaves by frost in January, 1913, but its crop was uninjured.

Fruit one and one-half inch long, about one-half as wide, broadest near middle, and rounded at both ends. Color very dark brown or black. Skin thick but tender, adhering closely to very dark brown or almost black flesh one-fourth inch thick, soft and melting unless the fruit has been thoroughly cured, when it becomes firm but usually slightly sticky. Seed seven-eighths inch long, one-fourth wide, slender and of almost uniform width; hazel in color with areas of chestnut. Ventral channel open and deep, germ pore nearer apex than base. Flavor agreeably sweet and slightly nutty, mild and not cloying.

The date of this name described by Kearney in Tunisia seems slightly different. The Tanasín palm at Tempe, Arizona, is from the Oued Rígh of Algeria, where I also obtained my specimens. It matures in midseason and is particularly prized because of the evenness with which all berries on the cluster ripen at one time. In native commerce it is usually sold pressed into skins, and a mixture of Tanasín, Tantabúsht, and Deglet Núr, jammed together in this manner, is said to be the nomad's idea of the extreme of high living.

Tantabúsht, Tantaboucht, Tantaboosht, an Algerian and Tunisian variety of remarkable appearance—nearly round, and almost black in color. It is soft, and does not keep its shape well unless thoroughly cured. It is highly prized by the natives, who say that before it is fully ripe it has the flavor of a good baked potato. It plays an important part in the caravan trade of the Sahara, where it is cheap.

Fruit nearly spherical, one to one and one-half inch in greatest diameter, base flattened or slightly

depressed. Color very dark brown or purple, almost black. Skin thin and tender, adhering closely to flesh but wrinkled indiscriminately; when long dried the fruit often shows light-colored scars, short and usually longitudinal, but sometimes making almost a net work over limited areas of the surface. Flesh one-fourth inch thick, golden brown in color with a lighter layer toward center; soft and syrupy, becoming granular after the lapse of a year. Seed five-eighths inch long, three-eighths wide, loose in cavity, mummy brown to russet in color, usually smooth but sometimes quite rough, ventral channel closed except for a noticeable opening near apex, germ pore nearer base than apex. Flavor remarkably sweet, like molasses in a well-cured fruit; sometimes a slight astringent taste. Ripens midseason but irregularly on bunch, if left on palm. Arabs usually pick an entire cluster when the dates begin to soften, and hang it indoors; they state that in a week or ten days the fruits will all ripen together.

Thúrí, Thoory, Tsurí, The Bull's Date, an Algerian dry date which has proved one of the most satisfactory in California. It is large, not hard, and of excellent flavor; the palm bears heavily and the clusters are of exceptional size. For this reason Arabs usually remove three-fifths of all the spathes after pollination. Rather late in ripening (about November 1). Hangs on the clusters well, so is often sold in that condition. The date is classed by Arabs as "hot," and not suitable for a prolonged and exclusive diet.

The fruit is one and three-quarters inch long, three-quarters inch wide, broadest in middle or

slightly nearer base, thence tapering slowly to rounded or bluntly pointed apex and flattened or depressed base. Color when fully dried is Indian chestnut red overspread by a thick bluish bloom, but skin is much raised in big folds and blisters which give a prevailingly hazel color to the date. Flesh three-sixteenths to one-fourth inch thick, deep golden brown, firm and nearly dry but not hard or brittle; white with some soft fibre toward center. Seed one inch long, three-eighths inch wide, stout, rounded at base, bluntly pointed at apex, cinnamon to ashy gray in color, ventral channel deep and partly closed, germ pore noticeably nearer base than apex; loose in cavity. Flavor sweet, nutty and delicate, no astringency; does not deteriorate even if kept for a year or more.

Timjúhart, Tinjuhart, Timdjouert, a common variety in the Mzab of Algeria,* which has done well in the United States. It is a soft date of average size and good flavor, which packs and keeps particularly well. When fresh it is bright red and so full of syrup that it drips. The cured date may be described as follows:

One and three-fourths inch long, three-fourths inch broad, widest at middle or slightly nearer base, thence tapering slightly to bluntly pointed apex and flattened base. Dark chestnut to purplish maroon in color. Skin thin and tender, adhering closely to flesh, sometimes profusely marked with short,

*The Mzab or Oued Mzab is a long string of oases, running north and south, in the Sahara of Algeria; it contains little more than 200,000 palms, but has an unusually large proportion of good varieties. Its inhabitants, the Mzabites, are not of Arab stock or language, but are a Berber or proto-semitic race, akin to the ancient Egyptians.

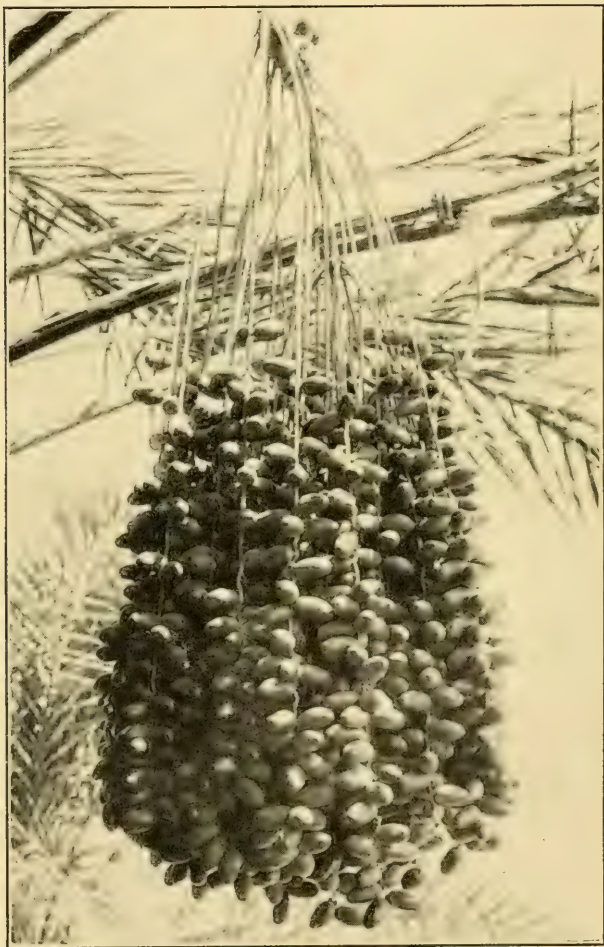
transverse scars. Flesh three-sixteenths inch thick, dark golden brown in color, firm but tender, sometimes granular. Seed hazel in color, one inch long, five-sixteenths inch wide, ventral channel shallow, sometimes broadly open and at other times partly closed, germ pore in center. Flavor very sweet but not cloying. Season from September 15 to October 1.

Turunja, Tronja, Troundja, The Citron (*Citrus medica*), a name probably suggested by its shape. A large, nearly spherical, soft date of Tunisia which has produced excellent fruits in California. It ripens in October. If allowed to remain on the palm it becomes practically a dry date. The variety is not common in its native home, but is highly esteemed by the natives; Europeans usually find it too sweet for a continued diet.

Kearney describes the fruit as perfectly round or nearly so, one and one-half to two inches in greatest diameter, maroon to prune purple when ripe, dull orange brown before maturity. Skin, where loose, tawny. Flesh three-eighths inch thick, firm or even tough, sugary. Seed very thick, six-tenths to seven-tenths as long as the fruit, three-fifths as long as wide, much furrowed, ventral channel closed, germ pore not distinguishable. Flavor rich, extremely sweet, cloying.

Usta'amrán. See Sayir.

Wáhí, The Oasis Date, a variety grown in several of the western oases of Egypt and also in the province of Gizeh. Offshoots imported into the



FIFTY POUND BUNCH OF DEGLET NURS

From imported offshoot planted May 4, 1905, by Fred N. Johnson of Indio, California. In 1910 it bore thirty pounds, in 1911 one hundred pounds, in 1912 one hundred and forty pounds, 1913 over two hundred pounds, and has during that time yielded eight offshoots.

United States have not yet fruited; seedling palms in Arizona have proved coarse and late, but this should not condemn the variety, which is highly esteemed in Egypt. This date, which ripens in August, is soft but keeps well, is longer and considerably broader than Deglet Núr, slightly translucent; flesh yellowish, granular midway between skin and seed. Seed blunt, irregular in outline. Flavor pronounced, delicious.

Yatímeh, Iteema, Itima, Ytima, The Orphan, one of the most popular North African varieties, considered by many native connoisseurs the equal of Deglet Núr; and one which has given particularly good results in California. It ripens toward the end of September, and is a great favorite with the Arabs when fresh, but also keeps well. The dates hang persistently to the clusters, and are usually sold in the market in this condition, but the Arab gourmand considers that they become insipid by so much exposure to the air, and for his own use packs each cluster in a box, surrounded with dry dates; they will remain in perfect condition for six months or a year.

Offshoots are considered rather delicate. The palm demands plenty of water and fertilizer in order to produce the best results. The yield is heavy.

Fruit two inches long, one-half as wide; widest at or near middle, rounded or flattened at base, broadly pointed at apex. Chestnut brown in color, with slight purplish bloom, the thick but tender and shiny skin raised all over the fruit, when it is cured, in tawny olive or ochraceous blisters. Flesh one-fourth inch thick, soft and syrupy when fresh, after-

ward becoming firm but tender and melting. Seed one inch long, three-sixteenths wide, rounded at base and apex, cinnamon or hazel in color, ventral channel nearly closed, germ pore in center. Flavor sweet, pronounced.

In some districts of Algeria this date is called *Al Qutár*, The Dripper, because syrup sometimes drips from it on the tree; the name might be freely translated "Honey Drips." In other districts *Al Qutár* seems to have been established as almost a distinct variety, distinguished by a little larger size and superior quality. It is almost a monopoly of the *shaykhs* and *kaid*s, who preserve it in jars to offer to guests as a particular delicacy.

Zaglúl, a large, soft, Egyptian date which has given good results in the United States, and is particularly valuable because of its early maturity. In Egypt it is much grown on sandy soil near Rosetta, where it receives no surface irrigation, and this probably accounts for its reputation as a shy bearer. Its seed is conspicuously small.

Eisen says*: "This variety is considered in Cairo as the best date that comes to that market, and it accordingly brings the highest price. It is sold in retail at eight piasters per oke (one oke is two and three-fourths pounds) or about fifteen cents a pound. It is from two to three inches long, of brown or reddish brown color, very highly flavored and sufficiently sweet but not exceedingly so. It is very meaty and is always eaten fresh. There are not over four bunches to the tree and the crop is never

*Eisen, Dr. Gustav. *Fruits in Egypt*. California Cultivator, vol. XL, No. 4, p. 100. Los Angeles, Jan. 23, 1913.

sufficiently extensive to allow any of it to be dried. There are several kinds of Zaghlúl, slightly differing in size and quality. The very best kind does not last more than a month or even less than a month."

Záhídí, Zehedi, Zadie, originally Azádí (Pers.),* Nobility, a remarkable dry date which is the principal commercial variety of Baghdád. To the planter it is valuable for its vigor, hardiness, resistance to drought and great prolificness—a yield of 250 pounds being common—while it is also one of the earliest to mature. To the dealer and shipper it commends itself because it can be sold in three forms, soft, dry, or half way between, and keeps well in any form. It is the principal food of most of the nomads around Baghdád, and is shipped to most of the ports of the Mediterranean; it will usually be found on sale in Marseille at a good price. It is much used in the manufacture of arrak, a distilled liquor whose production is an important industry at Baghdad; the date qualifies for this purpose because of its large sugar content. The flavor of Záhídí is not equal to that of Asharasí, but it is superior to most North African dry dates, containing very little tannin.

The palm is characterized by a thick, stout trunk, swelling at the base, and leaves rather erect, not recurving like most varieties. Their color is a healthy glaucous green; the spines are very large and stiff.

In its soft stage this date is picked about the middle of August and packed in boxes or more frequently in skins. In this condition it keeps for

*For the peculiar history of the names Záhídí and Khustáwí, see Pere Anastase-Marie, *Loghat el Arab* No. 10, p. 397. Baghdád, April, 1912.

months and is called Záhídí Kursí, the latter word being Sukkarí ("sugary") with the letters transposed. In this state it may be described as follows: Form oblong-obovate, broadest point about two-thirds distant from base to apex, after which it narrows slightly to the rounded apex and to the rather broad, flattened base; size medium, length one and one-quarter inch, breadth seven-eighths inch. Surface smooth, glossy, a beautiful, translucent, golden yellow in color, sometimes light golden brown; bloom unnoticeable. Skin rather thick and not easily broken, rarely wrinkled, and adhering closely to the flesh, which is translucent golden yellow near skin, becoming whitish toward seed; soft, meaty and full of syrup; one-quarter inch thick. Seed oblong, smooth, rounded at base, slightly tapering at apex, three-quarters to seven-eighths inch long, five-sixteenths inch wide, smooth, russet in color, ventral channel open. Flavor sweet, extremely sugary but not at all cloying, and possessing a remarkably fresh or rutab taste.

If the dates are allowed to remain on the palm a week or two longer, the whole cluster can be cut and hung up in a shop, the dates showing no tendency to become detached, even after four or five months. In this stage, which the Baghdádís call Záhídí Qass, (cut), the fruit is still soft and tender, but not sticky. The flavor is perhaps a trifle less rich than when the fruit is packed in skins, but it still has a unique freshness, so that one could eat such dates in February or March and almost persuade himself that they are fresh from the tree. I believe this date offers great commercial possibilities to California growers, since entire bunches could be furnished to grocers, who



FARDH PALMS IN SAMAIL VALLEY, ARABIA

Planted twenty feet apart and a subsidiary crop grown. Natives of this region are the most skilful Arab cultivators of the date.

would hang them up in the window just as they do a bunch of bananas.

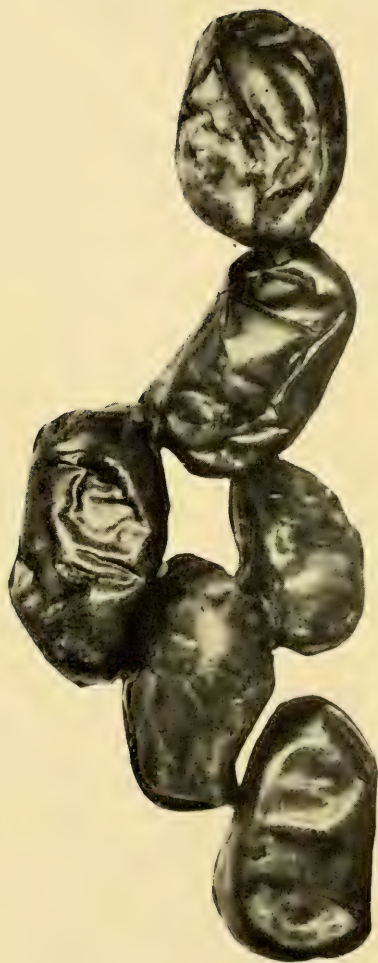
The principal export of the date from Baghdád, however, is in its third or dry state ("Záhidí Yábis"), when it may be described as follows: Form same as given above; size a trifle smaller. Surface hard and dry, slightly rough, deep straw color with sometimes a translucent, dark amber portion near apex. Skin hard and dry, tough and not easily broken; smooth near base and usually somewhat wrinkled and folded, and separating from flesh toward apex. Flesh dry but not mealy, three-sixteenths inch thick, dull white in color with frequently an amber portion near tip. Seed as described above. Flavor very sugary.

The variety has not yet fruited in California, but should be very successful. In the unfavorable climatic conditions of Tempe the only drawback to it has been a tendency, shown by most dates there, to ripen unevenly.

Zumreh Mimún, The Offshoot of Mimún (a personal name*), a very rare variety of the Zíbán in Algeria, probably a derivative of Deglet Núr, as it is said that an outsider can hardly distinguish the two varieties of dates, even if he sees them side by side. The date is described as of the same size and color as Deglet Núr, equally translucent, ripening in October, keeping well. The palm yields heavily only if it is given very good care. This variety has not yet fruited in the United States.

*It is the name, in Arabic orthography, of the famous Jewish scientist of the twelfth century A. D., Maimonides. To name a choice variety of date after him is certainly heaping coals of fire, for he denounced dates as injurious, and advised that they should be eaten rarely and then only before meals. Abú Amran Mouchí b. Mimoun, *The Principles of Physical and Moral Health*, tr. by M. Carcouse, Alger, 1887, p. 23.

APPENDIX



KHALASEH DATES FROM HASA, OMAN

The most famous variety of the Persian Gulf region; a transparent date of delicate but delicious flavor and beautiful appearance. Slightly less than natural size.

I QUARANTINE REGULATIONS

Anyone wishing to import date palm offshoots from a foreign country must obtain a permit from the Secretary of Agriculture, and must mark each box, case, or package with the name and address of importer and exporter, general nature and quantity of contents, district or locality and country where grown, and number of permit. Each package must either be accompanied by a certificate of inspection from the foreign country, stating that the plants are free from disease or pests, or the importer must file a bond with the collector of customs, to the amount of double the invoice value of the property, to insure that he will properly treat it to free it from scale and other pests, within forty days of arrival, under instructions from the quarantine officers; and the plants must not be removed from the port of entry until written notice is given by the agent of the Department of Agriculture to the collector of customs that the stock has been properly treated.

The only places into which palms can be shipped by an importer are:

In California, Riverside County, east of the San Bernardino meridian; Imperial County.

In Arizona, Yuma County, Maricopa County, Pinal County.

In Texas, Webb County.

After being properly treated in a cresol dip for two periods of fifteen minutes, separated by twenty-four

hours, offshoots may be moved to any point within the region above mentioned, but must be rooted in nursery form, and so kept for a year, when they will again be inspected, and if found free from scale they may be shipped to any point in the United States, if accompanied by a certificate of inspection from a duly authorized agent of the Department of Agriculture, showing that they are not infested. They can not be shipped outside the quarantine area unless free from scale; but inside the quarantine area they may be shipped to any point. In California, however, they must not be planted within 500 feet of seedling palms.

In regard to offshoots of local origin, either from imported palms or from seedlings, they may be shipped anywhere at any time if accompanied by the proper certificate showing that they are not infested. If they are infested, they can only be shipped within the quarantine area, or from one quarantined region to another.

The officers in charge of inspection on behalf of the Department of Agriculture will furnish all information desired. No fee is charged for inspection. The officers are:

In California: Bruce Drummond, Indio.

In Arizona: A. W. Morrill, Phoenix.

In Texas: J. D. Mitchell, Victoria.

Plant quarantine regulations are based partly on the Plant Quarantine Act passed by Congress last year and approved August 20, 1912, and partly on state regulations. The above synopsis represents the essential features of the act and regulations at the date of writing, September 1, 1913.

II

TO GROW BANANAS FROM DATE SEEDS

During the dark ages it was a widespread Arab superstition that bananas could, under certain circumstances, be grown from date seeds. The slight similarity in general appearance between the two plants was elevated to a real relationship, particularly by the Baghdád physician 'Abdu-l Latíf (twelfth century), in his Description of Egypt (pub. at Paris by Imperial Press, 1810, with tr. by S. de Sacy). The writer declares that to make the relationship evident all you need to do is to place a date seed in a fruit of the colocasia and bury it; the result will be a banana plant.

The plant which the Arabs designate as colocasia (Arab., from Pers., qulqás) is doubtless not *Colocasia antiquorum*, but the sacred water lily of the Egyptians, *Nymphaea lotus* (*Castalia mystica*). The way in which the writers speak of it shows, however, that they had only a hazy idea in mind, and probably did not really know what plant they were referring to.

Ibn Awám, the Spanish Moor who wrote his treatise on agriculture in the twelfth century, gives more detailed directions for performing the operation, in his chapter entitled "To Make a Date Seed Grow in a Colocasia Root, to Obtain a Banana by the Permission of God." He says:

"The manner of operating is to plant a colocasia root in a place constantly exposed to the sun, where one can water it abundantly and continuously and

protect it from wind. Water it carefully until the root sprouts; then dig away the earth, split the root with a gold-bladed knife, and in that cleft introduce the date seed. The operation must be concealed in such a manner that the colocasia root can not see what is being done, otherwise the operation will not succeed. The seed used should be from a date of the variety Kasbeh or any other delicate variety. Bind up the cut with reed leaves or woollen thread and plaster the whole thing over with mud mixed with fine hairs, then cover it four fingers deep with humus. Water it with sweet water daily or every other day until the germination is apparent, then you will see the banana appear. If planted in January or February you will get fruit at the end of summer; this fact is very extraordinary. Some think the seed should be broken before it is put in the cleft; I have tried it without success.

“A witness worthy of faith tells me he has seen the operation performed in the orient in this manner: Take a seed in its fruit, using pains to get a female seed—it is that which is short and not pointed at the end. Introduce the seed in a colocasia root, which resembles a turnip or artichoke root; cover it with a little humus, water it continuously, and abundantly, and there will appear a banana, which is a kind of colocasia, but rare in Spain, if indeed it is known at all.”

Another MS. version, more probably correct, makes Ibn Awám say that he has never been able to try the operation, because he could not secure any colocasias.



MAJHUL DATES OF TAFILALET, MORCCO

Slightly less than natural size. This date, ripened artificially, is the favorite on the markets of England and Spain.

III

"THE SWEAT" TALISMAN

The following talisman was in high repute among Arab date growers of the dark ages: Ibn Awám quotes the formula from the Book of Nabathean Agriculture:

"A man takes a sheet of copper weighing 70 to 140 mithqals (267 to 534 gr.). He goes to the middle of the field where he wishes to plant his date seeds; there he digs a hole to the depth of seven Nabathean feet (2.53 m.); then he takes a clay jar, very deep and rendered very hard by the action of a violent fire; he puts the copper tablet in it, after having rubbed it with olive oil. Plant the vase in the hole, and the seeds will give palms of excellent varieties, very sweet and handsome. This shall be done when the horoscope is in the two houses of Jupiter. If it is in Jupiter itself, that is excellent. The moon ought to be apparent and in conjunction with the sun, or else with Jupiter. If the moon is in one of the houses of this planet and the horoscope is there, it is very good. Distrust The Tail and Mars, for if one of them or both are in the horoscope, or if they occupy the middle of the sky, the palms produced by the seeds will be shy bearers. Kimáma says: 'Draw with an iron style on this sheet of copper the figure of a man with one hand above the other. Rub honey on the figure and olive oil on the rest of the plate; shake powdered sugar on the honey. Put the sheet in the jar and cover it with a layer of clay, then bury it among the roots of a palm which lets its fruit drop before they are ripe: it will retain them and its product will be as beautiful as possible'."

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